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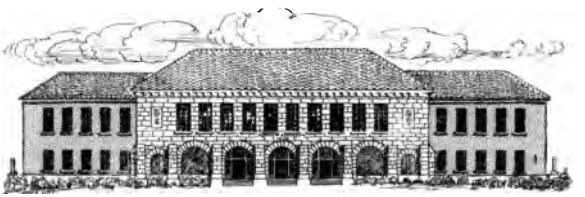
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ESSENTIALS OF ARITHMETIC

FIRST BOOK



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HARVEY'S ESSENTIALS OF ARITHMETIC

With Everyday Problems Relating to Agriculture, Commerce, and Other Vocations

FIRST BOOK

BY

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DEPARTMENT OF EDUCATION
RECEIVED
SEP 9 - 1914
LELAND STANFORD JUNIOR UNIVERSITY

AMERICAN BOOK COMPANY

NEW YORK CINCINNATI CHICAGO

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E. P. 2

PREFACE

THIS book is divided into three parts, presenting work for the second, third, and fourth years.

Part I, designed to cover the second year's work, is devoted to the counting of numbers to 100 and to the forty-five facts in addition and the corresponding facts in subtraction. In classes where a book is not desired before the third year, Part I may be used for rapid review.

Part II, for the third year, takes up notation and numeration to 10,000 and addition and subtraction of larger numbers, introducing the processes of carrying and borrowing. It develops also the multiplication and division table of 2's, with its many variations and applications.

Part III, for the fourth year, continues notation and numeration to millions, completes the multiplication and division tables, and gives formal work in multiplication and long division, as well as simple exercises involving easy fractions and mixed numbers.

United States Money, Making Change, Telling Time, Drawing to Scale, and the Measures, — inch, foot, yard, pint, quart, peck, gallon, etc., — are introduced at the points where the pupils are best prepared to deal with them.

The main purpose of the book is to secure accuracy and speed in the handling of numbers and sureness in the interpretation of such problems as come within the range of the child's experience. The interests of children at home and at school, however, suggest various applications of numbers to general problems of a prevocational character, such as

problems relating to agriculture, commerce, manual training, and household arts. Such problems have been used, wherever practicable, to stimulate the child's interest, in place of the more common problems of the old-time primary arithmetic, dealing with dolls and blocks and marbles and tops and perhaps too exclusively with dollars and cents.

After the primary combinations and the simpler operations are once mastered, the book presents each subject in its entirety, with enough drill to drive it home.

Attention is also called to the following features:

1. The work is carefully graded. Each new exercise is closely related to what has gone before; and the new thing to be taught is clearly emphasized.

2. As the abstract reasoning required in the explanation of the basic processes does not aid young pupils in the mastery of such work, it is reserved for a maturer age.

3. The importance of self-activity is recognized in asking the pupils to frame problems for themselves and to draw and cut out figures that help toward the comprehension of number relations.

4. Suggestions to teachers are scattered throughout the book wherever they may serve useful purposes.

5. The exercises for both oral and written work, including abstract and concrete examples, are abundant and varied.

6. The reviews are frequent, cumulative, and thorough. While the exercises are strong enough to test the pupils' power, they are not so hard as to cause discouragement or fatigue.

7. Problems without numbers are given to train the pupils to decide what each problem calls for, and how it may best be attacked, before they perform the operations. Such work strengthens the power of reasoning and develops habits that will be invaluable in subsequent work.

SUGGESTIONS

BEFORE beginning any recitation, the teacher should bear in mind the following four fundamental propositions:

(1) Each lesson should have a definite purpose.

(2) The teacher must clearly realize what must be known and done to accomplish this purpose.

(3) The teacher must consider how much of this material the pupil has already mastered.

(4) The teacher must then determine what the pupil has still to learn and how the known may best be related to the unknown.

The first condition essential for the intelligent use of an arithmetic by pupils is that they shall be able to read it intelligently. It is well, therefore, before a lesson is assigned, especially in the first book, to require an oral reading of what is to be learned, and to question closely to see whether the matter read is understood; then to assign definitely what the pupil is to memorize and whatever else he is required to do. If the pupils are trained to read the lessons readily, intelligently, and with good expression, the exercise has a distinct value as a reading lesson, paves the way for a thorough preparation of the new lesson, and materially increases the pupils' power to understand and use arithmetical language.

The teacher should be sure that the meaning of new and unusual words and expressions is understood by the pupils before they undertake the mastery of the lesson.

A new topic is frequently introduced by what is called the "Study Recitation." The matter under this heading should be mastered by the pupils under the immediate direction and stimulation of the teacher. The teacher should always thoroughly master the treatment of the subject matter under the "Study Recitation" in advance, and should be able to give the illustrations and applications without reference to the book, and to extend or modify them as may be found necessary. These exercises are given where special preparation for further work by the pupils is deemed necessary. The time required for such preparatory work is time saved, even if an entire recitation period is necessary, because the pupils will do the following assigned work more intelligently, with greater interest, and more rapidly than would be possible without such preparation.

Training in the statement of arithmetical facts, conditions, operations, and relations, correct in matter and form, should be carried on throughout the study of the subject, the requirements in this respect being adapted to the pupil's capacity. Definitions are statements of fact, and rules are statements of processes and of operations involving these processes. Unless the pupil can improve upon the form of these statements, he should learn them and make them a part of his arithmetical vocabulary.

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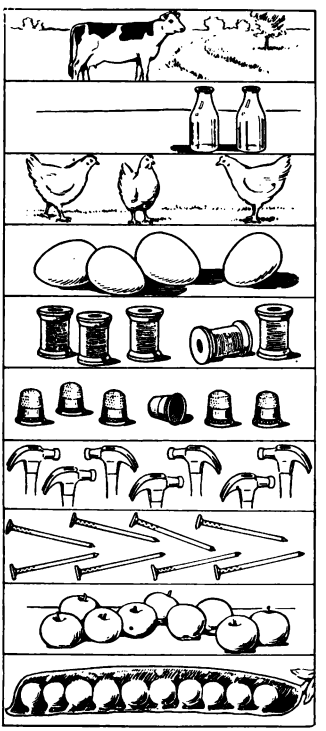
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FIRST BOOK

PART ONE



One cow	One	1
Two bottles	Two	2
Three hens	Three	3
Four eggs	Four	4
Five spools	Five	5
Six thimbles	Six	6
Seven hammers	Seven	7
Eight nails	Eight	8
Nine apples	Nine	9
Ten peas	Ten	10

One	Two	Three	Four	Five	Six	Seven	Eight	Nine	Ten
1	2	3	4	5	6	7	8	9	10

READING AND WRITING NUMBERS

ONE TO TEN

1. Read:

one bag	1 bag
two needles	2 needles
three pots	3 pots
four pans	4 pans
five hammers	5 hammers
six saws	6 saws
seven seeds	7 seeds
eight brooms	8 brooms
nine hats	9 hats
ten baskets	10 baskets

2. Count the pupils in your classroom and write the figures as you count.

3. Count desks, windows, pencils, and other things.

4. Write in figures: four, six, one, three, five, ten, seven, two, nine, eight.

5. Read: 8, 6, 7, 4, 5, 1, 2, 9, 3, 10.

6. Draw 5 rings, 4 squares, 3 trees, 7 lines, 8 dots.

7. Draw a ladder and write on the steps from the bottom up: 9, 8, 10, 7, 6, 5, 2, 4, 3, 1. Read these numbers from the top down.

8. Cut from paper or cardboard: 3 circles, 5 squares, 2 mats, 6 napkins, 7 cards, 9 flags, 8 plates, 10 cents.

9. Place four pins on your desk in the form of a square.

READING AND WRITING NUMBERS

ELEVEN TO ONE HUNDRED

Ten and one more are eleven,	11
Eleven and one more are twelve,	12
Twelve and one more are thirteen,	13
Thirteen and one more are fourteen,	14
Fourteen and one more are fifteen,	15
Fifteen and one more are sixteen,	16
Sixteen and one more are seventeen,	17
Seventeen and one more are eighteen,	18
Eighteen and one more are nineteen,	19
Nineteen and one more are twenty,	20

Write in figures: fifteen, nineteen, eleven, thirteen, sixteen, twelve, seventeen, twenty, fourteen, eighteen.

TO THE TEACHER. The numbers from 1 to 100 should be written on the board or on a chart, and left for the pupils to copy at their seats. Give exercises in counting numbers forward and backward, between 1 and 100.

Write the following numbers and then read them:

1	11	21	31	41	51	61	71	81	91
2	12	22	32	42	52	62	72	82	92
3	13	23	33	43	53	63	73	83	93
4	14	24	34	44	54	64	74	84	94
5	15	25	35	45	55	65	75	85	95
6	16	26	36	46	56	66	76	86	96
7	17	27	37	47	57	67	77	87	97
8	18	28	38	48	58	68	78	88	98
9	19	29	39	49	59	69	79	89	99
10	20	30	40	50	60	70	80	90	100

THE NUMBER 2

Learn:

1 + 1 = 2	**2 − 1 = 1**
2 pints = 1 quart	**2 − 2 = 0**

To the Teacher. Make flash cards of stiff manila paper, 2½ in. by 4 in., containing the various number combinations. Use them with oral questions, for daily drills to insure the memorizing of results.

1. • and • are 2 dots. 2. • • less • is 1 dot.

The sign + is read **and** or **plus**. It means that the numbers between which it stands are to be added.

The sign − is read **minus** or **less**.

The sign = is read **equal** or **equals**.

1 + 1 = 2 is read 1 plus 1 equals 2, or 1 and 1 are 2.

2 − 1 = 1 is read 2 minus 1 equals 1, or 2 less 1 is 1.

3. One cent and one cent are how many cents?

Write 1 cent + 1 cent = 2 cents. 1 + 1 = 2.

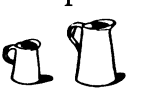
4. Put 2 cents on the desk; then take 1 cent away. How many are left?

1 cent from 2 cents leaves how many cents?

5.

1		2	
+1	Read	−1	Read 1 from 2 leaves 1.
2	1 and 1 are 2	1	Or, 2 minus 1 is 1.

6. There are 2 pints in a quart. If I pour out 2 pints of milk from a quart bottle of milk, how much milk is left in the bottle?

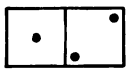


To the Teacher. Use pint and quart measures to illustrate this.

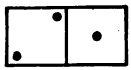
7. Make a problem about 1 pint and 1 pint.

THE NUMBER 3

Learn:



2 + 1 = 3	3 − 1 = 2
1 + 2 = 3	3 − 2 = 1
3 feet = 1 yard	3 − 3 = 0



1. Add 1 cent to 2 cents. How many cents have you?

2. 2 brooms and 1 broom are how many brooms?

3. 3 dollars less 1 dollar are how many dollars?

4. 3 needles less 2 needles are how many needles?

5. If there are 3 jelly jars on the desk and I take 3 jars away, how many are left?

6. Read: $3-2=1$; $2+1=3$; $1+2=3$; $3-1=2$.

7. Write the answers: $2+?=3$; $3-?=2$; $3-3=?$ $?+1=3$; $?-2=1$; $3-2=?$; $1+?=3$.

8. Make a problem about 3 seeds less 2 seeds.

9. Make a problem about 2 cents plus 1 cent.

10. Mary trimmed 2 hats and her sister trimmed 1 hat. How many hats did they both trim?



11. Write the answers:

2	3	3	1	3	1	2	2
+1	−2	−3	+2	−1	+1	−1	−2

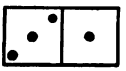
12. Make problems about birds, eggs, cents, mats, and stamps, using the numbers and signs in example 11.

13. If I cut 2 feet from a string a yard long, how many feet will be left?

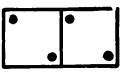
To the Teacher. Illustrate with foot and yard measures and string.

THE NUMBER 4

Learn:



3 + 1 = 4	4 − 1 = 3
1 + 3 = 4	4 − 3 = 1
2 + 2 = 4	4 − 2 = 2
4 quarts = 1 gallon	4 − 4 = 0



1. Add 1 cent to 3 cents. How many cents have you?

2. John wove 2 mats and Henry wove 2 mats. How many mats did both weave together?

3. Ruth swept 4 rooms and Elsa 2 rooms. How many more rooms did Ruth sweep than Elsa?



4. If 1 boy is standing, and 3 more stand up, how many are then standing?

5. If I pour 3 quarts of milk from a gallon of milk, how many quarts are left?

6. How many quarts must I add to 2 quarts to make a gallon?

7. Write the answers:

2	4	4	3	4	1	2	4
+2	−2	−4	+1	−3	+3	+1	−1

8. 2 + ? = 4 2 + 2 = ? 4 − 2 = ? 4 − ? = 2

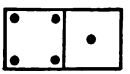
9. 1 + ? = 4 1 + 3 = ? 4 − 3 = ? 4 − ? = 0

10. Make problems about 2 eggs and 2 eggs; 4 cents less 3 cents; 3 ears of corn and 1 ear of corn.

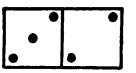
To the Teacher. Give daily, additional problems similar to those here suggested, on each number to 18.

THE NUMBER 5

Learn:



4 + 1 = 5	5 − 1 = 4
1 + 4 = 5	5 − 4 = 1
3 + 2 = 5	5 − 2 = 3
2 + 3 = 5	5 − 3 = 2



1. Add 1 cent to 4 cents. How many cents have you?

2. Add 2 cents to 3 cents. How many cents have you?

3. Five cents equal a nickel. If you spend 3 cents out of a nickel, how much have you left? if you spend 2 cents?



4. There were 5 birds in a nest; but 4 birds flew away. How many birds were left in the nest?



5. Make problems about 5 cents − 3 cents; 3 thimbles + 2 thimbles; 4 aprons + 1 apron; 5 pins − 2 pins.

6. Write the answers:

2	4	5	5	3	5	5	5
+3	+1	−3	−2	+1	−1	−5	−4

7. 2 + ? = 5 3 + 2 = ? 4 + 1 = ? ? + 4 = 5

8. 5 − 4 = ? 5 − ? = 2 5 − 2 = ? 5 − 1 = ?

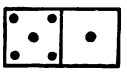
9. 1 and 1 and 3 are how many? Show it by marks upon the blackboard; by objects on the desk.

10. How many are 2 and 2; 1 and 3; 2 and 3; 5 − 4; 4 − 2; 1 from 3; 3 less 2; 5 less 4; 3 and 2; 2 and 2; 4 − 3; 5 − 5; 3 − 3; 5 less 3; 5 − 2?

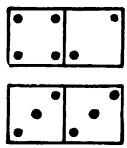
11. Count and write the numbers from 1 to 50.

THE NUMBER 6

Learn:



5 + 1 = 6	6 − 1 = 5
1 + 5 = 6	6 − 5 = 1
4 + 2 = 6	6 − 2 = 4
2 + 4 = 6	6 − 4 = 2
3 + 3 = 6	6 − 3 = 3



1. Add 1 cent to a nickel. How many cents have you?

2. A gallon and 2 quarts are how many quarts?

3. How many are 6 cows less 2 cows?

4. If there are 6 quarts of milk in a pail and I pour out a gallon, how much milk is left in the pail?

5. Make problems about 6 dots less 5 dots; 3 spoons and 3 spoons; 6 cents less 1 cent.

6. Write the answers:

5	6	4	2	3	6	6	6
+1	−2	+2	+3	+3	−5	−4	−6

7. 2 + 4 = ? 4 + ? = 6 6 − ? = 4 6 − 2 = ?

8. 3 + 3 = ? 3 + ? = 6 6 − ? = 2 6 − 4 = ?

9. 5	6	3	4	2	5	5	6
−2	−3	+2	+1	+2	−4	−3	−1

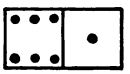
10. Helen had 6 stockings to darn. After she had darned 3 stockings, how many had she left to darn?

11. 2 and 1 and 3 are how many? 3 and 1 and 2?

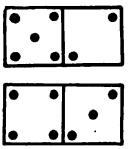
12. Count and write the numbers from 50 to 60.

THE NUMBER 7

Learn:



6 + 1 = 7	7 − 1 = 6
1 + 6 = 7	7 − 6 = 1
5 + 2 = 7	7 − 2 = 5
2 + 5 = 7	7 − 5 = 2
4 + 3 = 7	7 − 3 = 4
3 + 4 = 7	7 − 4 = 3



1. Add 1 cent to 6 cents. How many cents have you?

2. If you set a table with 5 plates and then add 2 plates, how many plates will there be on the table?

3. How many days are left in a week (7 days) after 2 days have passed?

4. Take 3 from 7; 5 from 7; 4 from 7; 6 from 7.

5. How many glasses must you add to 5 glasses on the table to make 7 glasses?

6. How many cents must you add to a nickel to make 7 cents?

7. Make problems about 4 days and 3 days; 7 cups − 5 cups; a nickel and 2 cents; 7 dusters less 1 duster.

8. Write the answers:

5	6	7	7	4	7	7	7
+2	+1	−4	−3	+3	−5	−6	−2

9. 5 + 2 = ? ?+2=7 7 − 5 = ? 7 − ? = 2

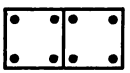
10. 4 + 3 = ? ?+3=7 7 − 4 = ? 7 − ? = 3

11. 3 + 3 + 1 = ? 4 + 2 + 1 = ? 2 + 3 + 2 = ?

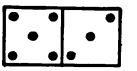
12. Count and write the numbers from 60 to 70.

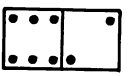
THE NUMBER 8

Learn:



7 + 1 = 8	8 − 1 = 7
1 + 7 = 8	8 − 7 = 1
6 + 2 = 8	8 − 2 = 6
2 + 6 = 8	8 − 6 = 2
5 + 3 = 8	8 − 3 = 5
3 + 5 = 8	8 − 5 = 3
4 + 4 = 8	8 − 4 = 4





1. Add 1 cent to 7 cents. How many cents have you?

2. I need 8 yards of cloth for a dress. I need 5 yards for the skirt. I need —— yards for the waist.

3. From 8 cents take 5 cents; 4 cents; 2 cents; 6 cents; 3 cents; 7 cents.

4. Make problems about 8 spoons less 3 spoons; 5 dollars and 3 dollars; 6 needles and 2 needles.

5.

4	2	8	6	8	8	8	5
+4	+5	−4	+2	−3	−2	−6	+3

6. 5 + ? = 8 8 − 6 = ? 8 − ? = 6 8 − 5 = ?

Learn:

2 pints	= 1 quart
8 quarts	= 1 peck
4 pecks	= 1 bushel



To the Teacher. Illustrate with pint, quart, and peck measures the relative capacities of the three measures.

7. If a man has a peck of corn and sells 2 quarts, how many quarts has he left?

DRILL ON NUMBERS TO 8

To the Teacher. Either the teacher or the pupils may read the exercises. The answers may be either written or given orally.

1.

5	3	2		6	7	8	8
+2	+	+	+3	−	−	−6	−
	7	8	5	4	3		5

2.

8	8	3	4	8	8	2	7
−4	−2	+5	+4	−6	−1	+6	−2

3. Add:

2	1	3	2	4	5	2	1	4	5
2	2	1	3	2	1	1	2	3	2
2	2	3	1	1	2	3	1	0	1
2	2	1	2	1	0	2	4	1	0

4. 8 less 2, less 2, less 2 = how many?

5. 8 − 3 + 2 − 4 = how many?

6. 2 + 1 + 3 − 2 + 3 + 1 = ? 8 − 3 − 2 + 4 − 2 = ?

Subtract:

7.

6	6	7	5	7	3	2	8
−1	−3	−5	−4	−2	−1	−2	−6

8.

8	8	7	6	5	4	5	7
−5	−2	−3	−2	−3	−2	−2	−4

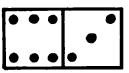
9.

8	4	6	7	5	2	3	1
−8	−4	−6	−7	−5	−2	−3	−1

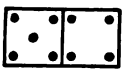
10. Count and write the numbers from 70 to 80.

THE NUMBER 9

Learn:



8 + 1 = 9	9 − 1 = 8
1 + 8 = 9	9 − 8 = 1
7 + 2 = 9	9 − 2 = 7
2 + 7 = 9	9 − 7 = 2
6 + 3 = 9	9 − 3 = 6
3 + 6 = 9	9 − 6 = 3
5 + 4 = 9	9 − 4 = 5
4 + 5 = 9	9 − 5 = 4



1. Add 1 cent to 8 cents. How many cents have you?
2. Add 2 cents to 7 cents; 4 cents to a nickel.
3. Add:

4	6	7	5	6	8	5	4	3	2
5	2	2	3	3	1	4	4	6	2

4. Subtract:

9	9	9	9	9	9	9	9	9	9
7	8	5	3	4	2	1	6	9	0

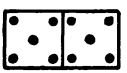
5. A man has 9 quarts of oats in a bag. If he gives a peck (8 quarts) to his horse, how many quarts remain?

Write the answers:

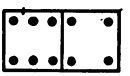
6. 5 + 4 = ? 9 − 5 = ? ? + 7 = 9 9 − ? = 5
7. 6 + 3 = ? 9 − 7 = ? ? + 5 = 9 9 − ? = 6
8. Make problems about 9 knives less 5 knives; 6 books and 3 books; 7 farms and 2 farms.
9. 2 + 2 + 4 + 1 = ? 9 − 4 − 2 − 1 − 2 = ?
10. Count and write the numbers from 80 to 100.

THE NUMBER 10

Learn:



$9 + 1 = 10$	$10 - 1 = 9$
$1 + 9 = 10$	$10 - 9 = 1$
$8 + 2 = 10$	$10 - 2 = 8$
$2 + 8 = 10$	$10 - 8 = 2$
$7 + 3 = 10$	$10 - 3 = 7$
$3 + 7 = 10$	$10 - 7 = 3$
$6 + 4 = 10$	$10 - 4 = 6$
$4 + 6 = 10$	$10 - 6 = 4$
$5 + 5 = 10$	$10 - 5 = 5$



1. Add 1 cent to 9 cents. How many cents have you?

2. There are ten cents in a dime. How much more is a dime than a nickel? than a cent?

3. Make problems about 10 cents less 4 cents; 10 lessons less 6 lessons; 8 days and 2 days; 10 dolls' beds less 7 dolls' beds; 10 quarts less 1 peck (8 quarts).

4. Add:

7	8	4	6	5	5	6	9	3	4
3	2	5	4	3	5	3	1	7	6

5. Subtract:

10	10	10	10	10	10	10	10
2	9	3	8	4	7	5	6

6. Mary is 10 years old; Helen is 6 years younger. How old is Helen?

7. Write and read the numbers from 1 to 100 whose right-hand figure is 0.

DRILL ON NUMBERS TO 10

1. Add quickly:

1	2		2	3		3	4		
1	1		2	1		2	1		
3	4	5	4	5	6	4	5	6	7
3	2	1	3	2	1	4	3	2	1
5	6	7	8		5	6	7	8	9
4	3	2	1		5	4	3	2	1

2. Name quickly the pairs of numbers whose sum makes 6, 4, 3, 2, 5, 9, 8, 7, 10.

3. Give sums and differences quickly:

8	9	6	10	5	9	2	8	9
−4	−5	+2	− 6	+5	−7	+3	+2	−3

4. Add:

			2	1	3	3	4	5
1	4	4	2	5	2	0	1	2
4	3	1	4	2	3	4	2	3
5	3	3	2	1	2	2	1	0

Add and subtract:

5. $4+5-3+2+2-5-4+3+2=?$
6. $2+3+4-7+6-4+2-5+9=?$
7. $10-2-2-2-2-2+3+3+3=?$
8. $10-3-3-3+4+4-6+4-2=?$
9. $10-2-3+5-6-4+3+5-1=?$

To the Teacher. Pupils may give results rapidly with books before them or from dictation, thus: nine, six, eight, ten, five, one, four, six.

THE NUMBER 11

Learn:

$9 + 2 = 11$	$11 - 2 = 9$
$2 + 9 = 11$	$11 - 9 = 2$
$8 + 3 = 11$	$11 - 3 = 8$
$3 + 8 = 11$	$11 - 8 = 3$
$7 + 4 = 11$	$11 - 4 = 7$
$4 + 7 = 11$	$11 - 7 = 4$
$6 + 5 = 11$	$11 - 6 = 5$
$5 + 6 = 11$	$11 - 6 = 5$

1. Add 1 cent to 1 dime (10 cents). How many cents have you?

2. Add 3 cents to 8 cents; 2 cents to 9 cents; 4 dollars to 7 dollars; 6 dollars to 5 dollars.

3. From 11 cents take 5 cents; 4 cents; 8 cents; 3 cents; 7 cents; 6 cents; 9 cents; 1 dime; 2 cents.

4. Make five problems in adding two numbers that make 11, choosing your own objects.

5. Add:

6	3	7	7	2	7	6	5	4	8
5	8	2	3	9	4	4	6	7	3

6. Subtract:

11	11	11	11	11	11	11	11
5	2	6	4	7	3	8	9

7. Martha made 6 needlebooks for Christmas presents and Cora made 11 needlebooks. How many more did Cora make than Martha?

THE NUMBER 12

Learn:

9 + 3 = 12	12 − 9 = 3
3 + 9 = 12	12 − 3 = 9
8 + 4 = 12	12 − 4 = 8
4 + 8 = 12	12 − 8 = 4
5 + 7 = 12	12 − 5 = 7
7 + 5 = 12	12 − 7 = 5
6 + 6 = 12	12 − 6 = 6

1. Add 1 cent to 11 cents. How many have you?

2. Add 2 cents to 1 dime; 4 cents to 8 cents; 3 dollars to 9 dollars; 5 cents to 7 cents.

3. From 12 cents take 9 cents; 6 cents; 8 cents.

4. Add:

3	8	4	7	5	6	6	8	7	9
9	3	8	4	7	5	6	4	5	3

5. Subtract:

12	12	12	12	12	12	12	12
9	3	8	7	5	6	4	2

6. 12 quarts are how many more quarts than 1 peck?

7. A class made 12 desk blotters, of which 7 were blue and —— red.



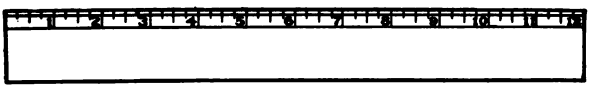
Learn:

There are 12 months in 1 year.
There are 12 things in 1 dozen.
There are 12 inches in 1 foot.



THE NUMBER 12

The following represents a ruler 1 foot or 12 inches long, drawn one fourth its length.



1. Get a foot ruler and draw a line 3 inches long. How much longer is the ruler than the line?

2. Draw lines 2, 4, 6, 5, 8, 7, 9, 10, and 11 inches long, and ask and answer the same question as in Ex. 1.

To the Teacher. The pupils may cut out measures 1 inch wide and 1 inch, 2 inches, 3 inches, etc., in length and place them end to end, or measure them on a foot ruler to answer such questions as, "How much must be added to a 6-inch measure to make a 12-inch measure?" "If two 3-inch measures are placed end to end, how many inches will they measure?" etc.

3. Estimate the length and the width of this book. Measure it and see how nearly correct you were.

4. Estimate and then measure the length and the width of your desk and of other articles in your room.

5. If 3 buttons are used from a card containing a dozen buttons, how many buttons remain?

6. How many quarts of peas must I add to 1 peck of peas to make a dozen quarts?

7. A class made a dozen mats, 8 blue mats and — green mats.

8. What month of the year is January? March?

9. How long is it from January to the end of the year? from March to the end of the year?

THE NUMBER 13

Learn:

9 + 4 = 13	13 − 4 = 9
4 + 9 = 13	13 − 9 = 4
8 + 5 = 13	13 − 5 = 8
5 + 8 = 13	13 − 8 = 5
7 + 6 = 13	13 − 6 = 7
6 + 7 = 13	13 − 7 = 6

1. A dozen and 1 more are how many?

2. How much must I pay for a 5-cent loaf of bread and a quart of milk costing 8 cents?

3. How much more than a week are 13 days?

4. 8 and 5 are how many? 6 and 7? 9 and 4? 13 less 9? 8 from 13? 6 from 13? 5 from 13?

5. Make five problems about the number 13 using cents, dollars, seeds, workbags, or any articles you choose.

6. Add:

6	8	7	4	6	8	9	7	5	9
7	5	5	9	5	3	3	6	8	4

7. Subtract:

13	13	13	13	13	13	12	11
9	8	5	6	7	4	8	6

8. Find the cost of muffins for which the flour costs 2¢, eggs 3¢, butter 6¢, and milk 2¢.

9. 13 − 2 − 3 − 4 + 2 + 1 = ? 6 + 6 + 1 = ?

10. 2 + 5 + 4 − 3 − 5 − 2 = ? 3 + 3 + 3 + 3 + 1 = ?

THE NUMBER 14

Learn:

$9+5=14$	$14-5=9$
$5+9=14$	$14-9=5$
$8+6=14$	$14-6=8$
$6+8=14$	$14-8=6$
$7+7=14$	$14-7=7$

1. How much must you spend all together for a coat costing $ 8 and a dress costing $ 6?

2. Mary is 9 years old. In how many years will she be 14 years old?

3. 8 and 6 are how many? 7 and 7? 5 and 9? 14 less 6? 14 less 5? 8 from 14? 7 from 14?

4. Make five problems about the number 14, choosing your own objects.

5. Add:

9	8	8	6	7	8	6	6	5	7
5	5	6	6	7	4	8	7	9	5

6. Subtract:

14	14	14	13	14	13	12	14
5	9	7	6	8	5	7	6

7. Add:

3	4	6	7	5	2	8	9	5	6
4	2	2	2	3	6	2	1	2	3
2	2	2	3	3	1	1	2	2	2
5	4	4	2	2	2	3	2	3	3

THE NUMBER 15

Learn:

9 + 6 = 15	15 − 6 = 9
6 + 9 = 15	15 − 9 = 6
8 + 7 = 15	15 − 7 = 8
7 + 8 = 15	15 − 8 = 7

1. Add 1 cent to 14 cents. How many cents have you?

2. A week and how many days equal 15 days?

3. If you cut 9 inches from a piece of cardboard 15 inches long, how many inches will be left?

4. 8 and 7 are how many? 6 and 9? 15 less 8? 15 less 9? 6 from 15? 9 from 15?

5. Make five problems about the number 15, choosing your own objects.

6.

7	6	6	8	15	15	15	15
+8	+5	+9	+7	−8	−6	−9	−7

7. 9 + 6 − 8 + 6 + 1 = ?

8. 15 − 7 + 6 + 1 − 3 = ?

9. A nickel and a dime equal how many cents?

10. 9 + ? = 15 15 − ? = 8 ? + 8 = 15 15 − 9 = ?

11. 8 + ? = 15 15 − ? = 7 ? − 9 = 6 ? − 8 = 7

12. Add:

6	5	4	3	2	8	7	3	4	4
2	2	2	1	0	6	2	4	3	0
3	3	3	0	9	0	0	3	3	5
4	2	6	9	4	1	5	2	5	6

THE NUMBERS 16, 17, AND 18

Learn:

9 + 7 = 16	16 − 7 = 9
7 + 9 = 16	16 − 9 = 7
8 + 8 = 16	16 − 8 = 8
9 + 8 = 17	17 − 8 = 9
8 + 9 = 17	17 − 9 = 8
9 + 9 = 18	18 − 9 = 9

1. How many days are there in a week and 9 days?

2. How many quarts are there in 2 pecks?

3. 9 and 7 are how many? 16 less 8? 16 less 7?

4. If you spend 9 cents for pins and 8 cents for needles, how much do you spend all together?

5. James planted 18 kernels of corn and John 9 kernels. How many more kernels did James plant than John?

6. 9 and 8 are how many? 9 and 9? 17 less 8?

7. Make problems calling for the following sums and differences: 8 + 8; 9 + 7; 9 + 9; 9 + 8; 16 − 7; 17 − 9; 17 − 8; 16 − 8; 18 − 9; 16 − 9.

8. Find the answers:

9	9	8	9	16	16	18	17	17
+7	+8	+8	+9	−8	−7	−9	−9	−8

9. Add:

3	4	6	5	7	8	9	5	6	7
2	4	3	4	3	1	2	8	0	0
6	4	0	8	5	0	3	0	2	5
5	4	8	1	3	8	2	5	9	6

DRILLS IN ADDITION AND SUBTRACTION

DRILL 1

Give the sums rapidly from left to right and from right to left:

1+1	2+2	3+3	4+4	5+5	6+6	7+7
1+2	2+3	3+4	4+5	5+6	6+7	7+8
1+3	2+4	3+5	4+6	5+7	6+8	7+9
1+4	2+5	3+6	4+7	5+8	6+9	
1+5	2+6	3+7	4+8	5+9		
1+6	2+7	3+8	4+9			
1+7	2+8	3+9		8+8	9+9	
1+8	2+9			8+9		
1+9						

To THE TEACHER. This table should be placed on the board. Point to different combinations, and require pupils to give sums. The work must be done rapidly to be of any value. Pupils should know the sums, and not find them by counting. If a pupil does not know them, require him to commit to memory a certain number each day, until all are mastered. Use also the flash cards and oral questions, as suggested on p. 12.

DRILL 2

Name the missing numbers:

ILLUSTRATION: $8+?=15$. Say, $8+7=15$.

1. $1+?=2$; $2+?=4$; $3+?=6$; $4+?=8$; $5+?=10$.
2. $6+?=12$; $7+?=14$; $8+?=16$; $9+?=18$.
3. $1+?=4$; $2+?=5$; $2+?=7$; $3+?=7$; $4+?=9$.
4. $1+?=5$; $2+?=6$; $3+?=8$; $4+?=10$; $3+?=9$.
5. $3+?=10$; $2+?=10$; $2+?=8$; $5+?=13$; $9+?=15$.

DRILL 3

Substitute for the question marks the numbers needed to complete the sums:

1.	2.	3.	4.
$11 = \begin{cases} 9+2 \\ 8+3 \\ 7+4 \\ 6+5 \end{cases}$	$12 = \begin{cases} 6+? \\ 8+? \\ 9+? \\ 7+? \end{cases}$	$13 = \begin{cases} 9+? \\ 8+? \\ 6+? \\ 10+? \end{cases}$	$14 = \begin{cases} 9+? \\ 8+? \\ 7+? \\ 10+? \end{cases}$

5.	6.	7.	8.
$15 = \begin{cases} 9+? \\ 8+? \\ 10+? \\ 11+? \end{cases}$	$16 = \begin{cases} 9+? \\ 11+? \\ 8+? \\ 10+? \end{cases}$	$17 = \begin{cases} 9+? \\ 11+? \\ 10+? \\ 12+? \end{cases}$	$18 = \begin{cases} 9+? \\ 10+? \\ 11+? \\ 12+? \end{cases}$

DRILL 4

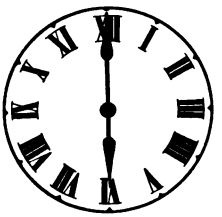
Subtract each number in each column from the number at the left of the column:

1.	2.	3.	4.	5.	6.	7.
7	10	7	8	9	5	9
4	6	2	7	12	8	7
10	8	5	9	13	7	8
8	4	3	10	15	13	5
12− 5	14− 9	11− 9	15−11	16− 8	17− 6	18−14
3	7	6	12	6	9	6
6	5	8	14	14	14	13
9	11	4	13	7	15	16
11	13	10	6	10	12	12
12	12	11	5	11	11	11

To the Teacher. Drill until each pupil can give all the differences in the table in one minute.

TELLING TIME — ROMAN NUMBERS

The Romans used letters for numbers. Such letters are often seen on clockfaces.



On the clockface in the picture the **hour hand** (the shorter hand) is pointing to VI (6) and the **minute hand** to XII (12). By this clock it is 6 o'clock.

The numbers on a clockface are:

I	II	III	IIII or IV	V	VI	VII	VIII	IX	X	XI	XII
1	2	3	4	5	6	7	8	9	10	11	12

Roman numbers are used also in numbering chapters of books. Except on clocks, IV is generally used for 4.

To the Teacher. Have the pupils make clockfaces of cardboard and let them move the hands around and read the time. Thus, "Place the hour hand between IX and X and move the minute hand to VI. What time is it? Move the minute hand to III. What time is it?"

1. Place the hands on the cardboard clockface to show 2 o'clock; 5 o'clock; 7 o'clock; 8 o'clock; 12 o'clock; half past 3; quarter past 4; quarter to 5; 10 minutes to 6; 10 minutes past 11; 25 minutes to 1.

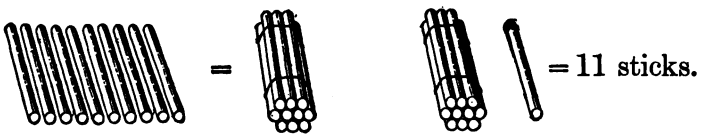
2. What time is it when the minute hand is at VI and the hour hand between III and IIII? when the minute hand is at IX and the hour hand near XII? when the hour hand is at IX and the minute hand at XII?

3. Read: IV, V, I, II, VI, III, VIII, IX, X, XII, XI, VII.

4. Write in Roman numbers: 2, 8, 9, 3, 1, 7, 5, 4, 10, 6, 12, 11.

UNITS AND TENS

1. If you have a number of sticks on the table, by what figure can you represent 1 of them?



2. If you tie ten of these sticks in a bundle, how can you represent the ten? 10 means 1 ten and 0 units.

3. How can you represent the 10 in the bundle, and 1 stick besides? It may be written 11.

$$\begin{array}{r} 10 \\ 1 \\ \hline 11 \end{array}$$

4. Which of the 1's in 11 stands for the 1 stick? which for the bundle of 10?

5. If there are 2 bundles of 10, what must you put in place of the 1 at the left of 0? if there are 3 bundles? 4 bundles? 5 bundles? 6 bundles? 7 bundles? 8 bundles? 9 bundles?

6. If you have 1 bundle of sticks and 2 sticks and you count them together, how many have you? How do you write the number? How many does the first figure at the right stand for? How many does the figure at the left stand for? both together?

7. If you have thirteen sticks, how can you write the number? What does the 1 stand for? the 3?

8. If you have nineteen sticks, how can you write the number? What does the 9 stand for? the 1?

When a figure stands alone, it tells how many ones or units. When two figures stand together, the left-hand figure tells how many tens.

9. 9 tells how many units? If a 1 stands at the left of the 9 (19), the 9 tells how many? the 1 tells how many?

10. If a 2 stands at the left of the 9 (29), what does the 2 stand for? What does the 9 stand for?

11. How is twenty written? How many 10's are there in 20? how many units?

12. If you have 2 bundles with 10 sticks in each, how many sticks have you in both? If you have 1 more stick, how many have you? if you have 2 more? 3 more? 4 more? 5 more? 6 more? 7 more? 8 more? 9 more?

13. With 10 more sticks, you can make another bundle of 10. How many bundles have you then?

3 bundles of 10 sticks are thirty (30) sticks.
4 bundles of 10 sticks are forty (40) sticks.
5 bundles of 10 sticks are fifty (50) sticks.
6 bundles of 10 sticks are sixty (60) sticks.
7 bundles of 10 sticks are seventy (70) sticks.
8 bundles of 10 sticks are eighty (80) sticks.
9 bundles of 10 sticks are ninety (90) sticks.
10 bundles of 10 sticks are one hundred (100) sticks.

COUNTING, READING, AND WRITING TO 100

(1) – – – – – – – – – – 10
(2) – – – – – – – – – – 20
(3) – – – – – – – – – – 30
(4) – – – – – – – – – – 40
(5) – – – – – – – – – – 50
(6) – – – – – – – – – – 60
(7) – – – – – – – – – – 70
(8) – – – – – – – – – – 80
(9) – – – – – – – – – – 90
(10) – – – – – – – – – – 100

To the Teacher. Place the dashes on the board and let the pupils count them. If desired, this work can be extended further at this point. See p. 42.

1. How many marks are there in each line?
2. How many marks are there in line 1?
3. How many marks are there in lines 1 and 2?
4. How many marks are there in lines 1, 2, 3?
5. How many marks are there in lines 1, 2, 3, 4?
6. How many marks are there in lines 1, 2, 3, 4, 5, 6, 7?
7. How many marks are there in lines 1, 2, 3, 4, 5, 6, 7, 8, 9, 10?

	Tens	Units
Twenty is written with a 2 and a 0.	20	
Twenty-one is written with a 2 and a 1.	21	

To the Teacher. Have pupils read the above statements and write the numbers as they read. Proceed in the same way with the numbers to thirty.

8. If you have made 10 marks, how many more must you make to have 20? 20 is how many more than 10?

9. If you have counted 20 marks, how many more must you count to count 30? 30 is how many more than 20?

10. 10 is one ten. 20 is how many tens? 30 is how many tens?

11. How many tens is 40? How many tens is 50? 60? 70? 80? 90? 100?

12. Write each number from 20 to 40 and tell how it is written.

Seat and Board Work

13. Copy the following table of numbers. Write the table from memory.

11	12	13	14	15	16	17	18	19	20
21	22	23	24	25	26	27	28	29	30
31	32	33	34	35	36	37	38	39	40

To the Teacher. Place the above table on the board and drill pupils in reading the numbers as you point to them rapidly.

14. Write each number from 40 to 100 and tell how it is written.

15. Copy the following table, writing the numbers to fill the blanks:

ten	is	1 ten or 10
twenty	is	2 tens or 20
thirty	is	3 tens or 30
forty	is	4 tens or 40

fifty	is	5 tens or —
sixty	is	6 tens or —
seventy	is	7 tens or —
eighty	is	8 tens or —
ninety	is	9 tens or —
one hundred	is	10 tens or —

16. Write with figures: 3 tens, 7 tens, 4 tens, 6 tens, 9 tens, 2 tens, 8 tens, 1 ten, 5 tens, 10 tens; twenty, fifty, thirty, seventy, ninety, sixty, ten, forty, eighty, one hundred.

17. Complete the table of numbers from 11 to 40 given in 13, by writing below your copy the numbers from 41 to 100.

Write the following numbers with figures, and write or tell the number of tens and units in each:

ILLUSTRATION: thirty-four $34 = 3$ tens, 4 units.

	a	*b*	*c*
18.	twenty-three	fifty-seven	fifty-six
19.	forty-five	eighty-eight	eighty-two
20.	twenty-four	ninety-nine	seventy-three
21.	thirty-six	eighty-five	twenty-eight
22.	seventy-two	sixty-seven	sixty-six
23.	eighty-one	thirty-nine	forty-four
24.	ninety-five	forty-seven	fifty-four

Read the following numbers, and tell the number of tens and units in each:

ILLUSTRATION: 21 twenty-one, 2 tens, 1 unit.

	a	*b*	*c*	*d*	*e*
25.	21	34	42	59	29
26.	32	78	37	63	47
27.	43	89	85	58	61
28.	54	56	64	84	82
29.	65	45	27	92	95
30.	76	23	35	36	73
31.	87	67	46	48	68
32.	98	99	83	57	79
33.	88	50	60	44	77
34.	75	40	70	39	38
35.	97	96	80	90	94
36.	22	33	55	66	93

DRILL EXERCISE

TO THE TEACHER. Dictate numbers and have pupils write them in columns until they can write correctly, neatly, and rapidly numbers less than 100.

Have one pupil dictate and the others write.

Write numbers less than 100 on the board and have pupils read the numbers as they are written.

Have one pupil write the numbers and others read.

Write many numbers on the board, point to different numbers rapidly, and have pupils read the numbers as you point to them.

Have pupils write all numbers from 10 to 100 whose units' figure is 2, 5, 3, etc.

ADDITION AND SUBTRACTION

Study Recitation

1. Add 45, 34, 79.

4 and 5 are 9. Write 9 under the 4 in the units' column.

3 and 4 are 7. Write 7 under the 3 in the tens' column.

2. Subtract 45 from 79, 34.

5 from 9 leaves 4. Write 4 under the 5 in the units' column.

4 from 7 leaves 3. Write 3 under the 4 in the tens' column.

Written

Add:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
3.	54	21	33	46	57	28	39	65
	33	65	42	52	11	40	20	34
4.	22	61	54	45	64	73	84	55
	57	38	34	22	12	23	10	24
5.	50	30	20	20	12	30	40	12
	20	10	40	30	23	15	15	23
	10	20	10	20	34	44	23	41

Subtract:

6.	97	86	75	64	53	42	31	20
	75	66	54	43	32	21	21	10
7.	60	88	84	33	32	77	85	99
	50	36	52	21	11	46	34	75

GENERAL REVIEW

1. Write: seventy-five, fifty-four, forty-seven, eighty.
2. Read: 25, 56, 78, 94, 21, 47, 50, 99.

Add at sight:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
3.	8	9	7	9	5	6	7	7	7
	5	4	6	9	5	8	8	7	9
4.	6	6	5	5	5	8	8	4	5
	6	9	9	7	6	9	8	7	7

Subtract at sight:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
5.	18	17	16	15	14	13	12	17
	9	8	7	8	6	8	7	6
6.	11	10	9	8	17	6	15	13
	5	4	3	4	5	3	6	6
7.	12	13	11	14	15	16	17	12
	5	7	6	8	7	8	9	7

Add:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
8.	2	4	7	5	4	3	2	7	6
	3	5	2	6	4	3	3	0	2
	5	4	3	4	4	3	4	3	1
	6	3	4	3	4	3	4	5	5

9. If I pour a pint of milk from a bottle containing a quart, how much milk will be left?

10. How many quarts must be added to 2 quarts to make 1 gallon?

11. I cut a foot from a stick a yard long. How much remains?

12. How many quarts must be added to 4 quarts to make 1 peck?

13. If you have a dozen buttons on one card and 6 buttons on another card, how many buttons have you?

14. Arthur's ruler is a foot long and Frank's is 8 inches long. How much longer is Arthur's ruler than Frank's?

15. What month of the year is June? How many months is it from June to the end of the year?

Add:

	a	*b*	*c*	*d*	*e*	*f*	*g*
16.	43	24	68	54	30	20	62
	34	34	31	43	40	70	31

Subtract:

17.	97	63	57	40	70	90	85
	46	52	40	40	50	60	44

Add:

18.	40	14	41	52	63	48	51	33
	30	12	32	13	20	30	22	34
	20	43	23	34	12	21	23	12

PART TWO

READING AND WRITING NUMBERS FROM 100 TO 10,000

1. Copy the following table, filling in the blanks:

		Hundreds	Tens	Units	
One	hundred is written	1	0	0	1 hundred, no tens, no units.
Two	hundred is written	2	0	0	2 hundreds, no tens, no units.
Three	hundred is written	3	0	0	_____.
Four	hundred is written	4	0	0	_____.
Five	hundred is written	5	0	0	_____.
Six	hundred is written	6	0	0	_____.
Seven	hundred is written	7	0	0	_____.
Eight	hundred is written	8	0	0	_____.
Nine	hundred is written	9	0	0	_____.

One hundred one is written 101.

	a	*b*	*c*	*d*	*e*	*f*	*g*
2.	102	110	118	126	134	210	290
3.	103	111	119	127	140	220	300
4.	104	112	120	128	150	230	400
5.	105	113	121	129	160	240	500
6.	106	114	122	130	170	250	600
7.	107	115	123	131	180	260	700
8.	108	116	124	132	190	270	800
9.	109	117	125	133	200	280	900

To THE TEACHER. Continue this exercise until pupils can write the numbers to 999.

The next number after 999 is 1000. Add 1 to 1000. The sum is written 1001.

10. Copy the following table, filling in the blanks:

One thousand, 1000, 1 thousand, no hundreds, no tens, no units.
Two thousand, 2000, _____.
Three thousand, 3000, _____.
Four thousand, 4000, _____.
Five thousand, 5000, _____.
Six thousand, 6000, _____.
Seven thousand, 7000, _____.
Eight thousand, 8000, _____.
Nine thousand, 9000, _____.
Ten thousand, 10,000, _____.

11. Write with figures: one thousand four, two thousand fifteen, three thousand twenty, four thousand six hundred, five thousand seven hundred five, nine thousand nine hundred ninety-nine.

Read the following numbers down and across. Then write them from dictation:

	a	*b*	*c*	*d*
	Hundreds, Tens, Units	Thousands, Hundreds, Tens, Units	Thousands, Hundreds, Tens, Units	Thousands, Hundreds, Tens, Units
12.	1 0	1 5 2 9	7 3 3 0	5 6 0 9
13.	1 1 0	3 1 2 8	2 7 3 8	1 4 0 0
14.	2 1 0	4 0 2 0	8 2 9 0	2 0 0 9
15.	3 0 5	5 4 2 7	6 5 3 9	6 4 0 5
16.	7 5 0	6 8 4 6	4 4 2 0	6 0 9 4

Read the following numbers; then write them from dictation:

	a	*b*	*c*	*d*	*e*
17.	1004	7009	3060	6020	8650
18.	2003	8008	7070	3050	3520
19.	3005	9001	8040	3410	7450
20.	4006	4008	9080	5630	8970
21.	5007	1040	5030	7480	9990
22.	6008	2050	4090	9250	2840

23. Write with figures: two hundred eight, two thousand eight, two thousand eighty, four thousand two hundred.

24. Write with figures: four thousand two hundred twenty, nine thousand, nine thousand nine, nine thousand ninety, nine thousand nine hundred.

25. Write with figures: nine thousand nine hundred ninety-nine, nine hundred, eight thousand forty-six, seven thousand eight.

26. Write with figures: one thousand one hundred seventy-five, two thousand three hundred twenty-six, four thousand five hundred sixty-five, seven thousand eighty-one, five thousand four hundred thirty-one, eight thousand forty-six, nine thousand six hundred seventy-two, nine thousand eight hundred two, five thousand four, eight thousand seven hundred twenty-seven, four thousand six hundred seventy-eight, six thousand one hundred eighty-seven.

Read the following numbers; then write them from dictation:

	a	*b*	*c*	*d*	*e*
27.	101	110	56	2154	437
28.	202	220	156	6003	5137
29.	304	430	147	92	6210
30.	403	340	9147	192	3405
31.	505	650	5060	323	83
32.	607	760	6505	1123	183
33.	706	270	78	7080	568
34.	808	980	178	8951	3168
35.	909	190	252	60	1870
36.	507	830	8152	134	5091

37. Write the numbers in examples 27, 28, and 29, placing 2 at the left of each number, and read; thus, 2101 (read, two thousand one hundred one).

Write the numbers in examples 27, 28, and 29, placing 3 at the left of each number and read.

In the same way, write the numbers again, using the figures 4, 5, 6, 7, 8, and 9 instead of 2 and 3.

Read; then write from dictation:

38.	309	3452	6198	7132	8152
39.	578	3450	7000	6015	9050
40.	659	3045	8100	7234	8005
41.	807	3004	9010	8010	7010
42.	999	2090	4050	9000	6900
43.	860	5009	5030	5090	5700

UNITED STATES MONEY

Learn:

5 cents = 1 nickel	100 cents = 1 dollar
10 cents = 1 dime	50 cents = 1 half dollar
10 dimes = 1 dollar	25 cents = 1 quarter dollar



The sign for cents is ¢.

1. How many cents are there in a nickel?
2. How many nickels are there in a dime?
3. How many dimes are there in a dollar?
4. How many quarters equal a half dollar?
5. Paul has a cent, a nickel, and a dime. How much money has he?

Make change from a quarter for:

6. Bread, 5¢.
7. Sugar, 8¢.
8. Thread, 10¢.
9. Pins, 6¢.

To THE TEACHER. Use toy money or have pupils cut out of heavy paper circles the size of the different coins, marking the value of each.

10. Find the total cost of a potato salad for which you use 4¢ worth of potatoes, 14¢ worth of eggs, and 5¢ worth of celery.

11. Find the cost of a cranberry mold for which 15¢ worth of cranberries and 9¢ worth of sugar are used.

DRILLS IN ADDITION AND SUBTRACTION

DRILL 1

Name the sums at sight:

1.	3	9	4	9	3	8	5	8	0
	8	9	8	8	7	8	7	0	3
2.	9	6	6	7	4	7	9	6	2
	6	8	6	5	6	9	0	7	0
3.	9	3	8	9	4	5	0	5	0
	5	9	7	2	9	8	5	5	7
4.	8	4	7	7	5	6	7	4	5
	2	7	6	7	6	4	0	4	0
5.	5	0	6	0	8	9	7	8	0
	3	4	3	6	5	7	8	9	8

DRILL 2

Name at sight:

1.	6+8	5+9	6+4	2+9	3+4	6+6	4+4
2.	7+9	8+2	4+7	3+8	2+3	7+7	3+6
3.	8+7	7+6	3+9	5+3	5+2	9+9	3+3
4.	5+8	8+4	9+4	8+8	2+7	7+3	8+9
5.	7+5	5+6	5+4	6+2	5+5	2+4	9+6

DRILL 3

To the Teacher. Drill the pupils on the numbers in the columns *A*, *B*, *C*, *D*, *E*, *F*, *G*, by naming any number and requiring pupils to give the first number larger having a given units' figure; the first number smaller having a given units' figure. Thus: Take the number 44; give the first number larger having the units' figure 6, 2, 8, 3, 7, 1, 0. Give the first number smaller having the units' figure 2, 8, 3, 5, 7, 6, 9, 1. This drill should be continued until pupils can tell the larger or smaller numbers without reference to the numbers in the columns.

A	*B*	*C*	*D*	*E*	*F*	*G*
10	23	36	49	62	75	88
11	24	37	50	63	76	89
12	25	38	51	64	77	90
13	26	39	52	65	78	91
14	27	40	53	66	79	92
15	28	41	54	67	80	93
16	29	42	55	68	81	94
17	30	43	56	69	82	95
18	31	44	57	70	83	96
19	32	45	58	71	84	97
20	33	46	59	72	85	98
21	34	47	60	73	86	99
22	35	48	61	74	87	100

Add:

1. 51 / 6 — What is the units' figure in the sum? What is the first number beyond 51 that has 7 for a units' figure? The sum is 57.
2. 57 / 6 — Units' figure? Next number with this units' figure? Sum?
3. 63 / 9 — Units' figure? Next number with this units' figure? Sum?
4. 79 / 8 — Units' figure? Sum?
5. 87 / 5 — Units' figure? Sum?
6. 56 / 8 — Units' figure? Sum?
7. 64 / 5 — Units' figure? Sum?

DRILL 4

To THE TEACHER. Drill pupils in adding 7 to each of the numbers in line 1 below beginning with 36. Thus: The units' figure in the sum of 7 and 6 is 3; 7 added to 36 gives the first number larger than 36 having 3 for a units' figure, or 43. 7 added to 56 gives 63; 7 and 26 are 33; 7 and 46 are 53; etc.

When pupils understand the mode of procedure, have them give the sums without naming the numbers added. Thus: 43, 63, 33, 53, 103, 73, 93, 23, 83, etc.

Continue drill by having each of the numbers from 1 to 10 added to the numbers in line 1. Proceed in the same way with the numbers in the other lines.

Vary the drill by having each of the numbers from 1 to 10 added to the numbers under *a*, *b*, *c*, etc.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
1.	36	56	26	46	96	66	86	16	76
2.	45	65	85	25	95	75	15	35	55
3.	24	44	64	94	74	34	84	14	54
4.	63	23	43	13	53	93	73	33	83
5.	42	72	62	32	12	52	82	92	22
6.	11	31	91	21	81	61	41	71	51
7.	37	87	27	67	17	97	57	77	47
8.	18	38	58	98	28	88	68	48	78
9.	60	50	40	20	30	10	90	80	70
10.	39	19	49	79	29	99	69	89	59

To THE TEACHER. Drill pupils in adding the numbers in columns. Thus: Beginning with 9 in the units' column under *a*, add the numbers in that column successively; to this sum add the numbers in the units' column under *b*, *c*, etc., until the sum is at least 100.

Vary the drill by beginning with any number less than 9 and then adding as before. Continue the drill until pupils can add accurately and rapidly to 100. Time them for results.

8	37
7	29
9	22
5	13
8	
37	

In beginning this exercise, place several figures in a column on the board.

Ask pupil to give sum of 8 and 5. When given, write 13 at the right of the 5. Ask for units' figure in sum of the right-hand figure in 13 and 9. When given, ask for first number larger than 13 having 2 for the units' figure. Write 22 at right of the 9. Ask for units' figure in sum of 2 and 7. Ask for first number larger than 22 having 9 for the units' figure. When given, write 29 at the right of 7. Ask for units' figure in sum of 9 and 8. Ask for first number larger than 29 having 7 for the units' figure. Write 37 at the right of 8. Draw a line underneath the column added, and write the sum below.

Continue similar work on the board until pupils have mastered the two steps, then have them add, writing only the last sum.

DRILL 5

To the Teacher. In subtracting the numbers 1 to 9 from numbers between 10 and 100, let the pupils subtract each of the lower numbers from the number represented by the figure above it, or if that number is the smaller, from that number increased by 10. Give the nearest number having this difference for its units' figure, which is smaller than the upper number.

Drill until the units' figure and the required number come to the mind as a single operation.

Illustrations

1. $\begin{array}{r} 34 \\ -\,6 \\ \hline \end{array}$ 4 is less than 6. Subtract 6 from $4 + 10$, or 14. The difference is 8. The first number below 34 having 8 for its units' figure is 28. $34 - 6 = 28$.

2. $\begin{array}{r} 38 \\ -\,3 \\ \hline \end{array}$ 8 is more than 3. 3 from 8 is 5. The first number below 38 having 5 for its units' figure is 35. $38 - 3 = 35$.

3. $\begin{array}{r} 22 \\ -\,8 \\ \hline \end{array}$ 2 is less than 8. Subtract 8 from 12. The difference is 4. The first number below 22 having 4 for its units' figure is 14. $22 - 8 = 14$.

4. $\begin{array}{r} 83 \\ -\,9 \\ \hline \end{array}$ 9 from 13 is 4. The first number below 83 having 4 for its units' figure is 74. $83 - 9 = 74$.

5. $\begin{array}{r} 76 \\ -\,9 \\ \hline \end{array}$ 9 from 16 is 7. The first number below 76 having 7 for its units' figure is 67. $76 - 9 = 67$.

6. $\begin{array}{r} 64 \\ -\,6 \\ \hline \end{array}$ 6 from 14 is 8. The difference is 58.

7. $\begin{array}{r} 56 \\ -\,8 \\ \hline \end{array}$ 8 from 16 is 8. The difference is 48.

8. $\begin{array}{r} 93 \\ -\,7 \\ \hline \end{array}$ 7 from 13 is 6. The difference is 86.

9. $\begin{array}{r} 95 \\ -\,9 \\ \hline \end{array}$ 9 from 15 is 6. The difference is 86.

10. $\begin{array}{r} 80 \\ -\,8 \\ \hline \end{array}$ 8 from 10 is 2. The difference is 72.

DRILL 6

To THE TEACHER. Have pupils subtract numbers from 1 to 10 from the numbers given in this table.

10	30	60	40	70	20	80	50	90
21	81	11	71	61	31	41	51	91
22	52	32	72	62	92	42	12	82
43	23	73	53	83	63	13	33	93
64	44	54	84	24	14	34	94	74
55	65	85	15	45	75	95	25	35
76	86	96	36	16	46	26	56	66
97	77	47	67	37	87	57	27	17
88	18	28	98	58	38	68	48	78
39	69	19	29	89	59	79	49	99

ADDITION

STUDY RECITATION

1. Add: $\begin{array}{r} 134 \\ 563 \\ \hline 697 \end{array}$

3 and 4 are 7. Write 7 under the 3 in the units' column.

6 and 3 are 9. Write 9 under the 6 in the tens' column.

5 and 1 are 6. Write 6 under the 5 in the hundreds' column.

Test by adding downwards: $4+3=7$; $3+6=9$; $1+5=6$.

Addition is the process of uniting two or more numbers to form one number.

The **sum** is the answer in addition.

WRITTEN

2. Add:

a	*b*	*c*	*d*	*e*	*f*	*g*
421	514	641	754	186	137	148
532	453	322	240	513	621	241

3. Add upwards, and test by adding downwards:

400	210	360	270	380	363	142
300	334	423	205	305	414	225
100	410	110	312	303	222	312

4. If \$230 is paid for rent and \$645 for food and clothing, what is the total expense?

STATEMENT. The total expense is the sum of \$230 and \$645, or — dollars.

5. A piano costs \$450 and a set of furniture, \$125. Find the total cost.

Add:	*a*	*b*	*c*	*d*	*e*	*f*
6.	351	464	782	843	445	640
	640	323	215	112	453	357
7.	307	433	674	415	308	402
	242	555	324	480	300	403
8.	174	314	562	714	800	752
	325	534	423	235	100	247
9.	253	842	876	543	210	468
	441	154	123	455	546	231
10.	415	753	369	482	507	246
	334	132	430	214	302	503
11.	302	664	666	777	888	899
	654	302	333	222	111	100
12.	317	575	604	503	802	907
	532	304	25	65	85	91
13.	201	486	513	612	509	914
	654	400	266	202	490	65

14. If I pay $200 for a lot and $750 for a bungalow, what is the cost of both?

15. The cost of fitting out a class in woodworking is $200 and in metal work $65. Find the total cost.

STUDY RECITATION

1. Add: 74, 8, 82

8 and 4 are 12. Write 2, the units' figure of the sum, under 8, and add 1, the tens' figure, to the next column. 1 and 7 are 8. Write 8 in the tens' column.

2. Add: 74, 68, 142

8 and 4 are 12. Write 2, the units' figure of the sum, under the 8, and add 1, the tens' figure, to the next column. 1 and 6 and 7 are 14. Write 4, the first figure in the sum, at the left of the 2 and under 6, and 1 at the left of 4.

3. Add: 359, 269, 532, 1160

2, 9, and 9 are 20. Write the 0 under 2. Add the 2 to the next column. 2, 3, 6, and 5 are 16. Write the 6 under 3. Add 1 to the next column. 1, 5, 2, and 3 are 11. Write 11 at the left of 6.

WRITTEN

Add and test the following:

	a	*b*	*c*	*d*	*e*	*f*
4.	56	42	493	792	527	472
	23	75	846	487	843	681
	75	29	275	369	657	937

5. In a class in paper cutting 23 of the pupils are girls and 19 are boys. How many pupils are there?

STATEMENT. The number of pupils in the class is the sum of 23 pupils and 19 pupils, or —— pupils.

6. A boy spends 35¢ for a saw, 85¢ for a brace, and 10¢ for tacks. How much does he spend?

STATEMENT. He spends for all the sum of 35 cents, 85 cents, and 10 cents, or —— cents.

7. A train of cars goes 38 miles the first hour, 49 miles the second hour, and 44 miles the third hour. How far does it go in the three hours?

STATEMENT. The train goes in 3 hours the sum of 38 miles, 49 miles, and 44 miles, or —— miles.

8. The girls in class A modeled 48 clay objects and in class B 54 objects. How many objects did both classes model?

STATEMENT. Both classes modeled 48 objects + 54 objects, or —— objects.

9. A merchant buys from one farmer 28 pounds of butter; from another, 36 pounds; from a third, 48 pounds. How many pounds does he buy from the three?

STATEMENT. He buys from the three farmers the sum of 28 pounds, 36 pounds, and 48 pounds, or —— pounds.

10. If I buy 4 quarts of milk for 24 cents, and 2 pounds of butter for 58 cents, what is the entire cost?

11. Dora made a doll's dress which cost her 25 cents for lawn, 18 cents for lace, and 16 cents for ribbon. What was the entire cost?

Add:	12.	13.	14.	15.	16.
	256	493	127	325	278
	324	257	890	268	139
	152	842	374	423	456

Add upwards and test by adding downwards:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*
17.	9	8	7	6	4	3	8	2	9
	8	3	0	0	9	0	7	1	7
	7	5	3	2	0	8	6	3	6
	6	4	0	1	8	2	5	4	8
	4	9	5	2	7	0	4	5	4
	2	7	8	5	6	5	3	6	6

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
18.	62	41	80	53	71	49	37	88
	58	77	94	78	89	42	21	56
	49	65	40	84	95	65	49	48
	98	89	52	49	71	82	78	39

	a	*b*	*c*	*d*	*e*	*f*
19.	549	809	950	740	800	604
	628	999	579	321	607	915
	447	450	468	879	503	702

	a	*b*	*c*	*d*	*e*	*f*
20.	765	900	333	601	999	357
	234	800	444	710	888	618
	987	200	999	503	777	704

	a	*b*	*c*	*d*	*e*	*f*
21.	600	545	819	746	917	908
	600	433	416	834	823	756
	800	729	528	972	456	243

REVIEW

1. Beginning with 1, count by 3's to 52; by 4's to 53.
2. Beginning with 2, count by 4's to 50; by 5's to 52.
3. Beginning with 3, count by 5's to 53; by 3's to 51.
4. Beginning with 4, count by 6's to 52; by 4's to 52.
5. Beginning with 5, count by 6's to 53; by 5's to 50.
6. Beginning with 6, count by 7's to 55; by 6's to 54.
7. Beginning with 7, count by 7's to 56; by 8's to 55.
8. Beginning with 8, count by 8's to 56; by 9's to 53.
9. Beginning with 9, count by 9's to 54; by 6's to 57.
10. Beginning with 10, count by 10's to 50; by 5's to 100.
11. Beginning with 52, count by 3's to 100.
12. Beginning with 50, count by 4's to 102.

Find the sums:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
13.	28	69	87	47	94	68	75	36
	56	47	23	65	18	57	48	87

	a	*b*	*c*	*d*	*e*	*f*	*g*
14.	98	236	152	842	673	547	437
	76	145	278	357	427	238	120
	83	783	569	364	508	123	506

15. $48 + 57 + 29 + 36 + 52 + 78 + 46 = ?$

To the Teacher. Have the pupils add the numbers given in each of the five columns at the bottom of p. 45.

16. A farmer has 250 bushels of wheat in one bin and 386 bushels in another bin. How many bushels has he in both bins?

17. A farmer takes 35 bushels of corn to market on Monday, 38 bushels on Tuesday, and 42 bushels on Wednesday. How many bushels does he take to market on the three days?

18. A boy has in his bank a half dollar, two quarters, 4 dimes, and 4 cents. How much money has he in the bank?

19. A garden is 48 feet long and 30 feet wide. Draw an oblong of the same form as the garden and mark the length of each side. How many feet is it around the garden?

20. Class A makes 49 baskets; class B 29 baskets; and class C 30 baskets. How many more does class A make than class B? How many more do class B and C together make than class A?

21. John earns 40 cents selling papers on Monday. Henry earns 10 cents more than John. How many cents does Henry earn? How many cents do both earn?

22. A man takes a trip and is gone three days. The first day he goes 150 miles; the second day, 195 miles; and the third day, 219 miles. How many miles does he travel during the three days?

23. Mary is 18 years old. Her mother is 36 years older. How old is her mother?

SUBTRACTION

STUDY RECITATION

1. Subtract:

689	**minuend**	3 from 9 leaves 6.	Write 6 in units' column.
543	**subtrahend**	4 from 8 leaves 4.	Write 4 in tens' column.
146	**remainder**	5 from 6 leaves 1.	Write 1 in hundreds' column.

Test. $146 + 543 = 689$.

The **subtrahend** is the number to be subtracted.

The **minuend** is the number from which the subtrahend is to be subtracted.

The **difference**, or **remainder**, is the result of the subtraction.

WRITTEN

Subtract, and test the answers by adding the remainder to the subtrahend:

	a	*b*	*c*	*d*	*e*	*f*
2.	597	985	883	769	493	957
	425	654	672	454	233	540
3.	973	857	729	958	906	700
	421	613	319	213	503	600

4. A man earned \$ 895 a year and spent \$ 763. How much did he save?

STATEMENT. He saved \$ 895 − \$ 763, or ——.

5. How much is lost by buying a house for \$ 958 and selling it for \$ 632?

Subtract and test:

	a	*b*	*c*	*d*	*e*	*f*
6.	899	788	676	565	434	843
	265	344	253	434	202	620
7.	876	543	689	758	948	877
	345	312	578	443	543	406
8.	900	876	954	768	857	925
	300	560	443	553	442	601
9.	808	959	878	679	485	398
	507	348	454	223	352	107
10.	700	800	900	500	400	300
	400	500	400	300	200	100
11.	609	708	805	403	302	501
	405	506	304	302	201	400
12.	508	707	809	904	603	508
	302	202	705	303	501	402

13. If it costs \$650 to fit out class A in woodworking and \$678 for class B in forging, how much more does it cost for class B than for class A?

14. If a lot costs \$450 and a house \$990, how much more does the house cost than the lot?

STUDY RECITATION

1. Subtract:

$$\begin{array}{r} 42 \\ 7 \\ \hline 35 \end{array}$$

7 cannot be taken from 2. Take 1 ten (= 10) from the 4 tens (leaving 3 tens). Add this 10 to 2, making 12. 7 from 12 = 5. Write 5 below the 7. Write the 3 tens left in the minuend below the 4.

2. $\begin{array}{r} 42 \\ 27 \\ \hline 15 \end{array}$

7 cannot be taken from 2. Take 1 ten (= 10) from the 4 tens (leaving 3 tens). Add this 10 to 2, making 12. 7 from 12 = 5. Write 5 below the 7. 2 tens from 3 tens (left in the minuend) = 1 ten. Write 1 below the 2. *Say:* 7 from 12, 5; 2 from 3, 1.

3. $\begin{array}{r} 80 \\ 24 \\ \hline 56 \end{array}$

4 cannot be taken from 0. Take 1 ten (= 10) from the 8 tens (leaving 7 tens). 10 + 0 = 10. 4 from 10 = 6. Write 6 below the 4. 2 tens from 7 tens (left in the minuend) = 5 tens. Write 5 below the 2. *Say:* 4 from 10, 6; 2 from 7, 5.

4. $\begin{array}{r} 435 \\ 276 \\ \hline 159 \end{array}$

6 cannot be taken from 5. Take 1 ten (= 10) from the 3 tens (leaving 2 tens). Add this 10 to 5. 6 from 15 = 9. Write 9 below the 6. 7 tens cannot be taken from 2 tens (left in the minuend). Take 1 hundred (= 10 tens) from the 4 hundreds (leaving 3 hundreds). 10 tens + 2 tens = 12 tens. 12 tens − 7 tens = 5 tens. Write 5 below the 7. 2 hundreds from 3 hundreds (left in the minuend) = 1 hundred. Write 1 below the 2. *Say:* 6 from 15, 9; 7 from 12, 5; 2 from 3, 1.

5. $\begin{array}{r} 430 \\ 178 \\ \hline 252 \end{array}$

8 cannot be taken from 0. Take 1 ten (=10) from the 3 tens (leaving 2 tens). 8 from 10 = 2. Write 2 below the 8. 7 tens cannot be taken from 2 tens (left in the minuend). Take 1 hundred (= 10 tens) from 4 hundreds (leaving 3 hundreds). 10 tens + 2 tens = 12 tens. 7 tens from 12 tens = 5 tens. Write 5 below the 7. 1 hundred from 3 hundreds = 2 hundreds. *Say:* 8 from 10, 2; 7 from 12, 5; 1 from 3, 2.

6. $\begin{array}{r} 400 \\ 264 \\ \hline 136 \end{array}$

4 cannot be taken from 0. As there are no tens in the minuend, take 1 hundred (= 10 tens) from the 4 hundreds (leaving 3 hundreds). Now take 1 ten (= 10) from 10 tens (leaving 9 tens). 4 from 10 = 6. Write 6 below the 4. 6 tens from 9 tens (left in the minuend) = 3 tens. Write 3 below the 6. 2 hundreds from 3 hundreds (left in the minuend) = 1 hundred. Write 1 below the 2.

Say: 4 from 10, 6; 6 from 9, 3; 2 from 3, 1.

Test. 136 + 264 = 400.

7. $\begin{array}{r} 4000 \\ 2123 \\ \hline 1877 \end{array}$

3 cannot be taken from 0. As there are no tens or hundreds in the minuend, take 1 thousand (=10 hundreds) from the 4 thousands (leaving 3 thousands). Take 1 hundred from the 10 hundreds (leaving 9 hundreds). Take 1 ten from the 10 tens (leaving 9 tens). 1 ten = 10. 3 from 10 = 7. Write 7 below the 3. 2 from 9 = 7. Write 7 below the 2. 1 from 9 = 8. Write 8 below the 1. 2 from 3 = 1. Write 1 below the 2.

Say: 3 from 10, 7; 2 from 9, 7; 1 from 9, 8; 2 from 3, 1.

Test. 1877 + 2123 = 4000.

To the Teacher. If preferred, the teacher may teach the method of adding 1 to the next figure of the subtrahend instead of subtracting 1 from the next figure of the minuend. Thus in example 7, *say:* 3 from 10, 7; 3 from 10, 7; 2 from 10, 8; 3 from 4, 1. Only one method, however, should be taught.

Written

Subtract, and test the answers:

	a	*b*	*c*	*d*	*e*	*f*	*g*
8.	58	67	75	94	82	91	85
	49	39	58	56	58	74	69
9.	82	75	63	92	80	50	40
	79	46	57	68	29	34	26

Subtract, and test the answers:

	a	*b*	*c*	*d*	*e*	*f*
10.	468	523	428	642	275	429
	273	216	254	375	138	273
11.	421	582	671	414	404	802
	316	415	218	339	147	768
12.	300	400	500	600	700	800
	129	256	348	459	567	648
13.	401	302	709	504	603	202
	394	236	648	457	368	149
14.	568	644	787	876	924	856
	479	388	599	789	278	649
15.	678	543	312	904	803	702
	239	408	209	807	706	605
16.	500	700	800	900	600	500
	399	498	387	265	448	356
17.	461	810	711	653	540	430
	315	209	506	349	495	356
18.	342	640	503	700	805	607
	127	584	398	499	367	598

Subtract, and test the answers:

	a	*b*	*c*	*d*	*e*	*f*
19.	642	278	147	242	427	302
	354	129	98	157	309	199
20.	454	372	821	565	921	873
	278	134	649	286	754	596
21.	420	560	710	840	970	950
	318	239	487	256	765	769
22.	502	404	907	800	704	801
	203	306	789	647	525	638
23.	903	402	704	605	801	900
	875	347	289	567	498	599

	a	*b*	*c*	*d*	*e*
24.	5009	6004	8003	9006	7005
	3099	4055	6784	7893	4982
25.	3988	2068	4040	3254	9090
	2999	1489	3067	2305	4596
26.	3000	5000	4000	8000	7000
	1899	3718	2627	2536	3445
27.	5060	4080	7902	6050	4030
	2675	3796	5887	4878	2969

28. In class A there are 238 pupils, and in class B 196 pupils. How many more pupils are there in class A than in class B?

STATEMENT. In class A there are 238 — 196 or —— more pupils.

29. There are 365 days in a year. If school is in session 176 days in a year, how many days during the year is there no school?

30. If James buys a reader for 35 cents, and gives the merchant a dollar bill in payment, how much change should he get?

31. The minuend is 38, the subtrahend is 17. What is the difference?

32. Which is the smaller, the minuend or the subtrahend?

33. The difference between two numbers is 8; the smaller number is 4. What is the larger number? Which is the minuend? Which is the subtrahend?

34. The sum of two numbers is 24. One of them is 8. What is the other? Which of the three numbers is the minuend? Which is the subtrahend?

35. What is a minuend? a subtrahend? a difference or remainder?

36. The sum of two numbers is 54. One number is 16. What is the other number?

37. The sum of three numbers is 256; the sum of two of them is 118. What is the other number?

38. There are 408 pupils in the High School and 650 pupils in the Elementary School. How many more pupils are there in the Elementary School than in the High School?

39. How much more is a ton of coal than 875 pounds of coal? (**1 ton = 2000 pounds.**)

40. The total cost of fitting out one school for manual training work is $3000 and the cost for another school is $2158. What is the difference in these costs?

41. A man's salary is $1800 a year. If he pays $560 for rent and $480 for other expenses, how much can he save in a year?

42. How many years had passed in 1914 since the discovery of America by Columbus in 1492?

43. The sum of two numbers is 4956 and one of the numbers is 1878. What is the other number?

44. If the furniture for a two-story house costs $2150 and the furniture for the first floor costs $1489, how much does the furniture for the second story cost?

45. At a fair 2468 tickets were sold on Monday and 1579 tickets on Tuesday. How many more tickets were sold on Monday than on Tuesday?

46. If I owe $500 for rent and $750 for other expenses and have only $898 cash, how much money must I draw from the bank to pay my bills?

UNITED STATES MONEY

The dollar sign, $, placed before a number, means the same as the word "dollar" or "dollars" written after the number. Thus, $25 is read 25 dollars.

When dollars and cents are written as one number, a period is placed between the dollars and the cents. Always read the word *and* between dollars and cents. Thus, $15.10 is read fifteen dollars and ten cents.

Read: $10.15, $35.10, $46.27, $32.12, $156.35.

When cents are written alone, two figures are used with a point and the $ sign at the left. Thus, $.25 is read twenty-five cents; $.37 is read thirty-seven cents.

If the number of cents is less than ten, it is written thus, $.01, $.02, $.03, $.04, $.05, $.06, $.07, $.08, or $.09, and read one cent, two cents, three cents, etc.

When numbers representing dollars are written in columns, the sign is placed before the top number only.

Read the following. Add:

1.	2.	Subtract:	3.	4.
$25.15	$156.20		$21.10	$200.50
18.25	37.50		12.05	140.25
17.75	56.38		$9.05	5.
207.12	86.12			$12.75
$268.27				10.49

Place all the decimal points in each example in the same column. Put the decimal point in the answer under the other decimal points.

Read; then add the columns, *a*, *b*, *c*, and *d*.

	a	*b*	*c*	*d*
6.	$8.75	$4.29	$44.53	$500.55
7.	9.69	3.82	22.89	666.31
8.	4.23	7.66	33.68	800.05
9.	1.49	8.54	65.72	700.25
10.	5.25	4.78	54.85	705.05
11.	3.86	5.99	96.34	800.00

12. Add:

a	*b*	*c*	*d*
$46.17	$184.40	$257.83	$456.05
39.18	200.00	666.66	348.09
25.63	745.05	805.49	999.87
18.57	321.89	703.84	654.28

Write:

13. Fifty-six dollars and seventy-five cents.
14. Forty-eight dollars and nineteen cents.
15. Four cents, six cents, ten cents.
16. Twenty-five cents, seventy-five cents, fifty cents.
17. One hundred dollars and twenty-two cents.
18. Six hundred forty-five dollars and nine cents.
19. Seven hundred thirty dollars and three cents.
20. Subtract:

a	*b*	*c*	*d*
$657.63	$743.84	$657.81	$864.25
348.79	567.99	549.29	475.89

MAKING CHANGE

To THE TEACHER. Explain to the pupils how change is made in stores. Thus, if a sale amounts to 32 cents and you give the clerk $1, he may hand you 3 cents and say "35," then 5 cents and say "40," then a dime and say "50," then a half dollar and say "one dollar." Usually the largest coins possible are selected; but the pupil should be encouraged to make other combinations of coins. Use toy money or paper circles to represent money, as suggested on p. 46.

1. Count out the change from $.25 for a loaf of bread at $.05.

2. Count out the change from $.25 for a spool of thread, $.05, and a card of hooks and eyes, $.08.

3. Count out the change from $.50 for a pencil, $.05, a pad, $.12, and a ruler, $.07.

Make change from $1 for the following purchases:

4. Lace, $.46 6. Pins, $.39 8. Comb, $.15
5. Cord, $.54 7. Lawn, $.57 9. Belt, $.76

Make change from $5 for the following purchases:

10. Cap, $3.25 12. Pot, $.48 14. Bag, $3.24
11. Hat, $2.75 13. Pan, $.56 15. Tea, $1.36

Make change from $10 for the following purchases:

16. Bowl, $6.75 18. Fan, $4.36 20. Bell, $3.24
17. Vase, $7.50 19. Fur, $9.58 21. Tray, $7.89

22. Suppose you are a clerk in a dry-goods store. I buy a yard of ribbon for $.35 and a card of buttons for $.28. I hand you $2. Count out my change.

23. Count out the change from $10 for cake pans, $2.80, and sugar shakers, $1.25.

MULTIPLICATION AND DIVISION — TABLE OF TWOS

Study Recitation

To the Teacher. Many problems are given involving the use of the facts in the table of 2's, in order to accustom pupils to a great variety of forms of statement. This can best be done when the operations are familiar to pupils. The sign ¢ means cent or cents. 1¢ is read 1 cent; 2¢ is read two cents.

1. If apples cost 2¢ apiece, how many cents will 4 apples cost? We have learned how to find how much the 4 apples will cost by addition.

$$\begin{array}{r} 2¢ \\ 2¢ \\ 2¢ \\ \underline{2¢} \\ 8¢ \end{array}$$

$2¢ + 2¢ + 2¢ + 2¢ = 8¢$.

2. If apples cost 3¢ apiece, 4 apples cost $3¢ + 3¢ + 3¢ + 3¢$, or $12¢$.

3. How many times 2¢ is 8¢? How many times 2 is 8?

4. How many times 3¢ is 12¢? How many times 3 is 12?

5. If we remember that 4 times 2 is 8, and that 4 times 3 is 12, we can answer the questions above without taking the trouble to add.

Answer questions 3 and 4 without adding.

6. If I walk 2 miles an hour, how far can I walk in 4 hours?

7. If dishcloths cost 3¢ apiece, how many cents do 4 dishcloths cost?

8. If iron holders cost 5¢ apiece, how many cents do 2 iron holders cost?

9. How many inches equal two 4-inch measures?

If the same number is to be taken several times, we can shorten our work by **multiplying** instead of adding.

To multiply 2 by 3 is to take 2 three times. 3 times 2 is 6.

To multiply 4 by 3 is to take 4 three times. 3 times 4 is 12.

To multiply 5 by 2 is to take 5 two times. 2 times 5 is 10.

The **sign of multiplication** is $\times$. When placed between two numbers, it means that one is to be taken as many times as there are units in the other. There are 3 units in 3, and there are 4 units in 4. 3×4 means that 4 is to be taken 3 times or that 3 is to be taken 4 times. It may be read 3 times 4, or 3 multiplied by 4.

TABLE OF 2'S

Learn:

$2 \times 1 = 2$	$2 \times 5 = 10$	$2 \times 9 = 18$
$2 \times 2 = 4$	$2 \times 6 = 12$	$2 \times 10 = 20$
$2 \times 3 = 6$	$2 \times 7 = 14$	$2 \times 11 = 22$
$2 \times 4 = 8$	$2 \times 8 = 16$	$2 \times 12 = 24$

TO THE TEACHER. Multiplication of whole numbers is the process of taking a *number* a certain number of times. It is never a process of taking things. It is a short process of adding a *number* to itself.

Have pupils study this table until each separate fact in it can be given instantly, either factor being given first; as, $2 \times 3 = 6$ or $3 \times 2 = 6$. The pupil who cannot tell how many 2×7 is without going over the table from the beginning to that point does not know the product of 2 times 7.

Close study, many repetitions by the pupil, and quick, sharp drill by the teacher are necessary for the mastery of the Multiplication Table.

1. There are 6 nails in a box and they are to be divided equally between 2 boys. If each boy takes one nail from the box, how many are left in the box? If each boy takes another nail from the box, how many are left in the box? If each boy takes a third nail from the box, how many are left in the box? How many nails has each boy?

If the boys had known how many times 2 can be taken from 6, or how many times 2 is contained in 6, they would have known how many nails to take at first. 3×2 is 6; 2 can be taken from 6, 3 times, or 2 is contained in 6, 3 times, or $6 \div 2$ (read 6 divided by 2) equals 3, or $\frac{1}{2}$ of 6 (read one half of 6) equals 3.

The **sign of division** is $\div$. When placed between two numbers, it means that the number at its left is to be divided by the number at its right.

Learn: **To find one half of a number divide it by 2.**

2. If 6 nails are to be divided equally among 3 boys and each boy takes 1 nail from the box, how many nails are left in the box? If each boy takes another nail from the box, how many nails are left in the box? How many nails has each boy?

If the boys had known how many times 3 can be taken from 6, or how many times 3 is contained in 6, they would have known how many nails to take at first. 2×3 is 6. 3 can be taken from 6, 2 times, or 3 is contained in 6, 2 times, or $6 \div 3 = 2$, or $\frac{1}{3}$ of $6 = 2$.

If one number is multiplied by another, the result is called the **product.**

$2 \times 3 = 6$.

6 is the product of 2 times 3 and also of 3 times 2.

If one number is divided by another, the result is called the **quotient.**

If 6 is divided by 3, the quotient is 2.

If 6 is divided by 2, the quotient is 3.

3. How do you find $\frac{1}{2}$ of a number? $\frac{1}{3}$ of a number? $\frac{1}{4}$ of a number? $\frac{1}{5}$ of a number? $\frac{1}{6}$ of a number? $\frac{1}{7}$ of a number? $\frac{1}{8}$ of a number? $\frac{1}{9}$ of a number? $\frac{1}{10}$ of a number? $\frac{1}{11}$ of a number? $\frac{1}{12}$ of a number?

$2 \times 3 = 6$. $6 \div 2 = 3$. $6 \div 3 = 2$. $\frac{1}{2}$ of $6 = 3$. $\frac{1}{3}$ of $6 = 2$.

4. Notice that in the five statements only three different results are given, 6, 3, and 2. If you know any one of these five statements, you ought to be able to give the others.

$2 \times 4 = 8$.	$8 \div 2 = 4$.	$8 \div 4 = 2$.
$2 \times 5 = 10$.	$10 \div 2 = 5$.	$10 \div 5 = 2$.
$2 \times 6 = 12$.	$12 \div 2 = 6$.	$12 \div 6 = 2$.

To the Teacher. When the multiplication table is being learned, the division table should be learned, thus:

$3 \times 4 = 12$ and $4 \times 3 = 12$.
$12 \div 4 = 3$ and $12 \div 3 = 4$.
$\frac{1}{4}$ of $12 = 3$ and $\frac{1}{3}$ of $12 = 4$.

In the drill table below, have pupils read from the book what is given, stating the result in each case. Thus, $2 \times 2 =$ is read $2 \times 2 = 4$. Place the table on the board, point rapidly to the different numbers, and require pupils to give the indicated result.

Table for Drill

1. $2 \times 2 = 4$

$\frac{1}{2}$ of $4 = ?$ $\quad 4 \div 2 = ?$

2. $2 \times 3 = 6$ $\quad 3 \times 2 = 6$

$\frac{1}{2}$ of $6 = ?$ $\quad 6 \div 2 = ?$ $\quad 6 \div 3 = ?$ $\quad \frac{1}{3}$ of $6 = ?$

3. $2 \times 4 = 8$ $\quad 4 \times 2 = 8$

$\frac{1}{2}$ of $8 = ?$ $\quad 8 \div 2 = ?$ $\quad 8 \div 4 = ?$ $\quad \frac{1}{4}$ of $8 = ?$

4. $2 \times 5 = 10$ $\quad 5 \times 2 = 10$

$\frac{1}{2}$ of $10 = ?$ $\quad 10 \div 2 = ?$ $\quad 10 \div 5 = ?$ $\quad \frac{1}{5}$ of $10 = ?$

5. $2 \times 6 = 12$ $\quad 6 \times 2 = 12$

$\frac{1}{2}$ of $12 = ?$ $\quad 12 \div 2 = ?$ $\quad 12 \div 6 = ?$ $\quad \frac{1}{6}$ of $12 = ?$

6. $2 \times 7 = 14$ $\quad 7 \times 2 = 14$

$\frac{1}{2}$ of $14 = ?$ $\quad 14 \div 2 = ?$ $\quad 14 \div 7 = ?$ $\quad \frac{1}{7}$ of $14 = ?$

7. $2 \times 8 = 16$ $\quad 8 \times 2 = 16$

$\frac{1}{2}$ of $16 = ?$ $\quad 16 \div 2 = ?$ $\quad 16 \div 8 = ?$ $\quad \frac{1}{8}$ of $16 = ?$

8. $2 \times 9 = 18$ $\quad 9 \times 2 = 18$

$\frac{1}{2}$ of $18 = ?$ $\quad 18 \div 2 = ?$ $\quad 18 \div 9 = ?$ $\quad \frac{1}{9}$ of $18 = ?$

9. $2 \times 10 = 20$ $\quad 10 \times 2 = 20$

$\frac{1}{2}$ of $20 = ?$ $\quad 20 \div 2 = ?$ $\quad 20 \div 10 = ?$ $\quad \frac{1}{10}$ of $20 = ?$

10. $2 \times 11 = 22$ $\quad 11 \times 2 = 22$

$\frac{1}{2}$ of $22 = ?$ $\quad 22 \div 2 = ?$ $\quad 22 \div 11 = ?$ $\quad \frac{1}{11}$ of $22 = ?$

11. $2 \times 12 = 24$ $\quad 12 \times 2 = 24$

$\frac{1}{2}$ of $24 = ?$ $\quad 24 \div 2 = ?$ $\quad 24 \div 12 = ?$ $\quad \frac{1}{12}$ of $24 = ?$

12. Give the products of 2 in order, to 12 times 2. Thus, 2, 4, 6, 8, etc. Give them in reverse order.

13. Give the number of 2's in each of the following numbers: 4, 10, 18, 6, 12, 24, 20, 16, 8, 14, 22.

Drill Table — Different Forms of Questions

To the Teacher. Have pupils read from the book, giving required products and quotients. Ask the questions and have pupils answer. Have pupils ask the questions and other pupils answer.

1. Beginning with 2, count by 2's to 24.
2. 2 taken 4 times = ? 8 = how many 2's ?
3. 8 taken 2 times = ? 16 = how many 2's ?
4. 2 taken 3 times = ? 24 = how many 12's ?
5. 6 taken 2 times = ? 24 = how many 2's ?
6. 12 taken 2 times = ? 14 = how many 2's ?
7. 4 taken 2 times = ? 10 = how many 2's ?
8. 2 taken 11 times = ? 14 = how many 7's ?
9. 9 taken 2 times = ? 12 = how many 6's ?
10. 2 taken 10 times = ? 18 = how many 2's ?
11. 7 taken 2 times = ? 22 = how many 2's ?
12. 2 taken 5 times = ? 22 = how many 11's ?
13. 11 taken 2 times = ? 18 = how many 9's ?
14. 9 can be taken from 18 how many times ?
15. 2 can be taken from 24 how many times ?
16. $18 \div 2 = ?$ $20 \div 10 = ?$ $\frac{1}{2}$ of $14 = ?$
17. $2 \times 8 = ?$ $24 \div 2 = ?$ $\frac{1}{2}$ of $24 = ?$

18. $20 \div 2 = ?$ $16 \div 8 = ?$ $\frac{1}{2}$ of $20 = ?$

19. $12 \times 2 = ?$ $22 \div 2 = ?$ $\frac{1}{11}$ of $22 = ?$

20. 8 contains 2 how many times? $\frac{1}{2}$ of $18 = ?$

21. 14 contains 7 how many times? $\frac{1}{7}$ of $14 = ?$

22. 6 contains 2 how many times? $\frac{1}{2}$ of $6 = ?$

PROBLEMS AND DRILLS

To the Teacher. In class work on problems, several plans may be employed. A pupil may read the problem and give the answer without explanation or analysis; or, after reading the problem, he may call on some other pupil to give the answer. The teacher may read the problem and call on the pupil to give the answer, without explanation or analysis.

A considerable portion of the work in each recitation should be of this kind, as it requires rapid work when properly conducted, and gives an opportunity for much practice in performing the various operations.

Another plan is to have the pupil give an analysis of the problem after reading it or hearing it read. The analysis may be in the form of a statement of each operation in order, in such a manner as to show the reason for it, or it may be in the form of question and answer, the pupil stating the first question which must be answered in order to solve the problem, and then answering it. This is followed by the next question and answer, and so on, until the required answer is reached. When this form of analysis is used, each question should give all the conditions necessary for the correct answer without reference to preceding questions.

Training in the analysis of arithmetical problems should be begun early and continued throughout the course, as it cultivates clear and exact expression and clear thinking. It is not necessary to require a formal analysis of all problems, but there should be enough of this work to satisfy the teacher that each pupil understands and can state what he is doing.

Oral

1. How many pints are there in 3 quarts?

Analysis: In 1 quart there are two pints; in 3 quarts there are 3 times 2 pints, or —— pints.

2. —— feet = 1 yard. How many feet are there in 2 yards? Fill the blank.

3. How many pecks = 2 bushels?

4. A pole is 6 feet in length. How many yards long is it?

ANALYSIS: A pole 6 feet long is as many yards long as 3 is contained times in 6, or —— yards long.

5. I buy 4 yards of ribbon at 2¢ a yard. What is the cost? I give the clerk a dime in payment. How much change do I receive?

6. A gallon equals —— quarts. How many gallons equal 8 quarts?

ANALYSIS: Since 4 quarts equal 1 gallon, 8 quarts equal as many gallons as 4 is contained times in 8, or 2 gallons.

7. At 8¢ a quart, find the cost of a pint of milk?

ANALYSIS: There are 2 pints in 1 quart. If milk costs 8 cents a quart, 1 pint costs $\frac{1}{2}$ of 8 cents, or —— cents.

8. At 2 cents a foot, what is the cost of 1 yard of rubber cord?

ANALYSIS: There are 3 feet in 1 yard. At 2 cents a foot 1 yard of rubber cord costs 3 times 2 cents, or —— cents.

9. How much do 2 yards cost?

10. Henry picks 8 pecks of nuts and sells $\frac{1}{4}$ of them. How many quarts does he sell?

ANALYSIS BY QUESTION AND ANSWER: 1st question: What is $\frac{1}{4}$ of 8 pecks? Answer: 2 pecks. 2d question: How many quarts = 2 pecks? Answer: 16 quarts.

11. How many quarts are $\frac{1}{2}$ of 4 pecks?

12. John has 6 hens and gives $\frac{1}{3}$ of them away. How many hens has he left?

ANALYSIS BY QUESTION AND ANSWER: 1st question: If John has 6 hens and gives $\frac{1}{3}$ of them away, how many does he give away? Answer: 2 hens. 2d question: If John has 6 hens and gives away 2, how many has he left? Answer: 4 hens.

13. If Mr. Smith's horses eat 2 pecks of oats in a day, in how many days will they eat 2 bushels of oats?

ANALYSIS BY QUESTION AND ANSWER: 1st question: How many pecks equal two bushels? Answer: 8 pecks. 2d question: If Mr. Smith's horses eat 2 pecks of oats in 1 day, in how many days will they eat 8 pecks? Answer: 4 days.

14. Jane buys 8 yards of ribbon, and uses $\frac{1}{4}$ of it in fastening together the sheets of a laundry list. How many yards are left?

15. Letters may be mailed in the United States for 2¢ an ounce. How many 2¢ stamps are needed for a letter weighing 2 ounces? 4 ounces?

16. Printed matter may be mailed at 1¢ for each 2 ounces. How many 2-cent stamps are needed for printed matter weighing 8 ounces? 10 ounces?

17. $3 \times 2 = ?$
$4 \times 2 = ?$
$2 \times 3 = ?$

18. $8 \div 4 = ?$
$6 \div 3 = ?$
$8 \div 2 = ?$

19. $2 \times 4 = ?$
$\frac{1}{2}$ of $4 = ?$
$\frac{1}{3}$ of $6 = ?$

20. $\frac{1}{2}$ of $4 = ?$
$\frac{1}{2}$ of $2 = ?$
$2 \div 2 = ?$

21. $\frac{1}{2}$ of $6 = ?$
$\frac{1}{4}$ of $8 = ?$
$6 \div 2 = ?$

22. $2 \div 1 = ?$
$? + 7 = 16$
$17 - 8 = ?$

WRITTEN

Add:

23.	24.	25.	26.	27.
246	285	568	$4.56	$15.25
327	463	342	3.25	21.17
154	729	756	7.18	84.96

ORAL

28. 4 boys have each 2 saws. How many saws have all? If the boys have 8 saws and each boy has 2 saws, what part of the whole number has each?

29. 2 nickels = how many cents?

ANALYSIS: 1 nickel = 5¢.
2 nickels = 2 times 5¢, or ——¢.

$\frac{1}{2}$ of 10¢ = ? Give two answers.
$\frac{1}{5}$ of 10¢ = ? $\frac{2}{5}$ of 10¢ = ? $\frac{3}{5}$ of 10¢ = ?

30. If $12 are divided equally between 2 men, how many dollars will each have?

31. If $12 are divided equally among 6 men, how much will each have?

32. How much is $\frac{1}{6}$ of $12? How many dollars are $\frac{2}{6}$ of $12? How many dollars are $\frac{3}{6}$ of $12? How much is $\frac{1}{2}$ of $12?

33. If I give one man $\frac{2}{6}$ of $12 and another man $\frac{1}{2}$ of $12, which will have more, and how much more?

34. Compare $\frac{3}{6}$ of $12 and $\frac{1}{2}$ of $12.

35. A boy buys 2 writing books at 10¢ apiece. How much does he pay for both?

36. If 2 pans cost 20 cents, how much does each cost?

ANALYSIS. Each costs $\frac{1}{2}$ of 20 cents, or —— cents.

37. If 20 cents are divided equally between 2 boys, how many will each have? Analyze.

38. If 20 cents are divided equally among 10 boys, how many will each have?

39. What part of the whole will each have?

40. What part of the whole will 2 boys have?

41. What number must be added to 8 to equal 14?

42. How many 2's must be added to 8 to equal 14?

43. What number subtracted from 20 leaves 12?

44. How many 2's subtracted from 20 leave 12?

45. If there are 9 plants in each of 2 rows, how many are there in both rows? If $\frac{1}{9}$ of the whole number are turnips, how many turnips are there? If $\frac{2}{9}$ of the whole number are cabbages, how many cabbages are there? How many turnips and cabbages are there?

46. If 2 pounds of rice cost 20¢, how much does 1 pound cost?

47. What are $\frac{3}{10}$ of 20?

48. If I divide 20 pieces of wood equally among 10 boys, how many will each have?

49. What part of the whole number will each have?

50. Compare $\frac{1}{10}$ of 20 with $\frac{1}{2}$ of 20.

51. 2 times 11 are how many? What is $\frac{1}{2}$ of 22? 11 is contained in 22 how many times?

52. If I divide 22 yards of lace equally among 11 girls, *how many yards* will each have? *What part* of the whole number will each have? What part of the whole number will 2 girls have? 4 girls? How many will 4 girls have?

53. 12 is what part of 24? 2 is what part of 24? 2 is contained in 24 how many times? $24 \div 12 = ?$

Give sums:

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
54.	8	7	8	7	5	4	6	5
	5	9	4	6	9	7	6	7
55.	28	37	18	37	25	34	56	85
	5	9	4	6	9	7	6	7
56.	9	4	3	2	59	44	73	42
	8	5	7	9	8	5	7	9

57. Subtract: WRITTEN

a	*b*	*c*	*d*	*e*	*f*
847	923	500	$14.27	$35.02	$75.09
256	478	289	11.63	19.46	28.63

58. Add:

959	922	400	$ 95.63	$ 99.77	$ 45.08
847	879	298	67.89	88.54	99.99

ORAL

59. Four 2's = ? Five 2's = ? Two 5's = ? $10 \div 2 = ?$ $10 \div 5 = ?$

60. $2 \times 5 = ?$ $5 \times 2 = ?$

61. 10 = 2 taken how many times? 10 = 5 taken how many times?

62. How many 2's are there in 10? how many 5's? How many times can you take 5 from 10? How many times can you take 2 from 10?

63. Six 2's = ? Two 6's = ?

64. 12 = 2 taken how many times? 12 = 6 taken how many times?

65. $12 \div 2 = ?$ $12 \div 6 = ?$ $\frac{1}{2}$ of 12 = ? $\frac{1}{6}$ of 12 = ?

66. How many 2's are there in 12? How many 6's are there in 12?

67. How many times can you take 2 from 12?

68. How many times can you take 6 from 12?

69. If I buy 6 yards of silk at \$ 2 a yard, what is the cost of the silk?

70. If 12 yards of silk are used for making 6 waists, how many yards are there in each waist?

71. 12 inches = 1 foot. John has a 1-foot ruler, and cuts off $\frac{1}{2}$ of it. How many inches does he cut off?

72. How many 6-inch measures are there in a foot rule? How many inches are there in 2 feet?

73. How many months are there in $\frac{1}{2}$ of a year?

74. How many months are there in $\frac{1}{6}$ of a year?

WRITTEN

	75.	76.	77.	78.	79.
Add:	24	15	64	39	80
	36	24	27	47	71
	45	36	34	58	59
	27	43	89	66	68
	93	82	52	75	90
	64	75	78	84	45
	28	46	64	93	33
	37	87	59	42	44
	42	93	33	81	69

ORAL

80. $2 \times 7 = ?$ $7 \times 2 = ?$ $\frac{1}{2}$ of $14 = ?$ $\frac{1}{7}$ of $14 = ?$

81. $14 = 2$ taken how many times? $14 = 7$ taken how many times?

82. $2 \times 8 = ?$ $8 \times 2 = ?$ $\frac{1}{2}$ of $16 = ?$ $\frac{1}{8}$ of $16 = ?$

83. If 8 oranges cost 16 cents, what is the cost of one orange?

84. How many hours will it take Daniel to drive 14 miles, if he drives at the rate of seven miles an hour?

85. James and Henry made pen trays for Christmas. James made 14 trays and Henry made $\frac{1}{7}$ of that number. How many did Henry make?

86. How long will 16 bushels of potatoes last, if 2 bushels are used each week?

	a	*b*	*c*
87.	$7 \times 2 = ?$	$2 \times 6 = ?$	$\frac{1}{7}$ of $14 = ?$
88.	$8 \times 2 = ?$	$\frac{1}{2}$ of $16 = ?$	$\frac{1}{8}$ of $16 = ?$
89.	$2 \times 7 = ?$	$\frac{1}{2}$ of $14 = ?$	$\frac{1}{2}$ of $10 = ?$
90.	$\frac{1}{4}$ of $8 = ?$	$8 \div 2 = ?$	$? \div 3 = 2$
91.	$16 \div 2 = ?$	$14 \div 2 = ?$	$? \div 7 = 2$
92.	$12 \div 2 = ?$	$? \div 2 = 7$	$12 \div ? = 6$
93.	$9 + 6 = ?$	$13 - ? = 4$	$12 \div 6 = ?$
94.	$9 + 7 = ?$	$? + 4 = 11$	$8 + 9 = ?$
95.	$16 - ? = 9$	$? - 7 = 5$	$15 - 9 = ?$

96. If 2 needlebooks cost 18 cents, what is the cost of 1 needlebook?

97. Mary has 20 cents; she spends $\frac{1}{10}$ of her money for a cake of yeast. How many cents does she spend? How many has she left?

98. John rides 9 miles on his bicycle on Thursday, and twice as far on Friday. How far does he go on Friday? in both days?

99. Henry sold from his vegetable garden 2 quarts of lima beans at 8 cents a quart, and spent 9 cents of what he received for beet seeds. How many cents had he left?

100. If 18 packages of seeds are divided equally among 9 boys, each boy receives how many packages? How many packages do 2 boys receive? 6 boys?

	a	*b*	*c*
101.	$9 \times 2 = ?$	$2 \times 10 = ?$	$\frac{1}{2}$ of $16 = ?$
102.	$10 \times 2 = ?$	$\frac{1}{2}$ of $20 = ?$	$\frac{1}{2}$ of $14 = ?$
103.	$2 \times 9 = ?$	$\frac{1}{10}$ of $20 = ?$	$\frac{1}{2}$ of $18 = ?$
104.	$\frac{1}{9}$ of $18 = ?$	$18 \div 2 = ?$	$20 \div 2 = ?$
105.	$\frac{1}{8}$ of $16 = ?$	$14 \div 2 = ?$	$18 \div 9 = ?$
106.	$\frac{1}{5}$ of $10 = ?$	$20 \div 10 = ?$	$? \div 2 = 6$
107.	$? \div 3 = 2$	$9 + 9 = ?$	$16 \div 8 = ?$
108.	$18 \div ? = 9$	$7 + 8 = ?$	$14 \div 2 = ?$
109.	$20 \div ? = 2$	$4 + 5 = ?$	$12 \div 6 = ?$

110. How many stamps at 2 cents each can you buy for 22 cents?

111. A pail holds 24 pints of milk. How many quarts does it hold?

112. James picks one half bushel of peas from his garden. How many pecks does he pick?

113. How many oranges at 2 cents apiece can I buy for 2 dimes?

114. There are how many desks in a row in your schoolroom? how many in 2 rows?

115. 2 is contained in each of the following numbers how many times and how many over: 3, 5, 6, 7, 9, 12, 13, 8, 11, 14, 10, 15, 16, 17, 20, 19, 18, 24, 25, 23?

116. If 12 girls together baked 24 apples, and each girl baked the same number, how many apples did each girl bake?

117. Multiply each of the following numbers by 2 and name the products:

4, 7, 12, 9, 11, 5, 3, 8, 10, 6, 1, 2.

118. Divide each of the following numbers by 2 and name the quotients:

8, 10, 6, 4, 12, 18, 14, 16, 24, 22, 20.

	a	*b*	*c*
119.	$11 \times 2 = ?$	$2 \times 2 = ?$	$\frac{1}{11}$ of $22 = ?$
120.	$12 \times 2 = ?$	$\frac{1}{2}$ of $24 = ?$	$\frac{1}{6}$ of $12 = ?$
121.	$2 \times 11 = ?$	$\frac{1}{2}$ of $20 = ?$	$\frac{1}{12}$ of $24 = ?$
122.	$24 \div 2 = ?$	$\frac{1}{5}$ of $10 = ?$	$? \div 12 = 2$
123.	$24 \div 12 = ?$	$\frac{1}{8}$ of $16 = ?$	$18 \div ? = 2$
124.	$22 \div 11 = ?$	$22 \div 2 = ?$	$12 \div 6 = ?$
125.	$18 \div 9 = ?$	$20 \div 10 = ?$	$12 \div ? = 6$
126.	$? - 6 = 5$	$18 \div 2 = ?$	$16 \div ? = 2$
127.	$? + 8 = 9$	$\frac{1}{7}$ of $14 = ?$	$18 \div ? = 9$

REVIEW

1. What is the minuend in subtraction? the subtrahend? the difference?

2. When a figure in the minuend is less in value than the figure below it, what must be done in order to subtract? What must be done to the next figure in the minuend?

3. What is the result called in addition? in multiplication? in division?

WRITTEN MULTIPLICATION AND DIVISION

Multiplication is the process of taking one number as many times as there are units in another.

STUDY RECITATION

1. Multiply:

3	6	8	4	5	7	12	9
2	2	2	2	2	2	2	2

2. Multiply:

$$\begin{array}{r} 31 \\ \times\ 2 \\ \hline 62 \end{array}$$

$2 \times 1 = 2$. Write the 2 under 1.
$2 \times 3 = 6$. Write the 6 at the left of the 2.

3. $$\begin{array}{rl} 423 & \textbf{multiplicand} \\ \times\ 2 & \textbf{multiplier} \\ \hline 846 & \textbf{product} \end{array}$$

$2 \times 3 = 6$. Write the 6 under the 3.
$2 \times 2 = 4$. Write the 4 under the 2.
$2 \times 4 = 8$. Write the 8 under the 4.

4. $$\begin{array}{rl} \$4.23 & \textbf{multiplicand} \\ \times\ 2 & \textbf{multiplier} \\ \hline \$8.46 & \textbf{product} \end{array}$$

Multiply as in example 3. Place the decimal point in the product under the point in the multiplicand.

The **multiplicand** is the number multiplied.

The **multiplier** is the number by which we multiply.

The **product** is the number resulting from the multiplication.

WRITTEN

Name multiplicands and multipliers and find products:

5.	6.	7.	8.	9.	10.
213	224	124	422	523	604
2	2	2	2	2	2

Divide:

11. $2\overline{)8}$ 2 in 8, 4 times. Write the 4 under the 8.

$$\frac{4}{2)8}$$

12. $2\overline{)16}$ 2 in 16, 8 times. Write the 8 under the 6.

$$\frac{8}{2)16}$$

13. $2\overline{)14}$ $8\overline{)16}$ $6\overline{)12}$ $9\overline{)18}$ $12\overline{)24}$ $11\overline{)22}$

14. $2\overline{)468}$ $\quad 234$

2 in 4, 2 times. Write the 2 under the 4.
2 in 6, 3 times. Write the 3 under the 6.
2 in 8, 4 times. Write the 4 under the 8.

Test. $2 \times 234 = 468$.

15. $2\overline{)608}$ $\quad 304$

2 in 6, 3 times. Write the 2 under the 6.
2 in 0, 0 times. Write the 0 under the 0.
2 in 8, 4 times. Write the 4 under the 8.

16. **divisor** $2\overline{)\$\,6.28}$ **dividend**
$\$\,3.14$ **quotient**

Place the point in the quotient immediately under the point in the dividend.

The **dividend** is the number divided.

The **divisor** is the number by which the dividend is to be divided.

The **quotient** is the number resulting from the division.

17.	**18.**	**19.**	**20.**	**21.**
$2\overline{)628}$	$2\overline{)426}$	$2\overline{)284}$	$2\overline{)\$\,4.22}$	$2\overline{)\$\,6\,24}$

22. $2\overline{)124}$ $\quad 62$

2 in 12, 6 times. Write the 6 under the 2.
2 in 4, 2 times. Write the 2 under the 4.

23.	24.	25.	26.	27.
2)1684	2)1824	2)1484	4)84	5)105

28.	29.	30.	31.	32.
8)1688	9)189	7)$1.47	4)$4.80	5)10000

33. There are 48 apples in a basket. If half of them are made into jelly, how many will be left? Find $\frac{1}{2}$ of the number by dividing it by 2.

Study Recitation

To the Teacher. In these examples, some of the partial products are greater than 9 and some of the partial dividends are not multiples of the divisors.

1. Multiply:

397
2
794

$2 \times 7 = 14$. Write the 4 under the 2.
$2 \times 9 = 18$. Carry, or add, the 1 in the 14 to 18, making 19. Write the 9 at the left of the 4 and under the 9.
$2 \times 3 = 6$. Add the 1 in 19 to 6, making 7. Write the 7 at the left of the 9 and under 3.

2. Multiply:

568
2
1136

$2 \times 8 = 16$. Write the 6 under the 2.
$2 \times 6 = 12$. Carry, or add, the 1 to the 12, making 13. Write the 3 under the 6 and carry the 1 to 2×5, making 11. Write the 11 at the left of the 3.

3. Multiply:

607
2
1214

$2 \times 7 = 14$. Write the 4 underneath.
$2 \times 0 = 0$. 1 added to $0 = 1$. Write the 1 underneath.
$2 \times 6 = 12$. Write the 12 at the left of the 1.

WRITTEN

Multiply:

	a	*b*	*c*	*d*	*e*	*f*
4.	357	468	509	927	346	576
	2	2	2	2	2	2
5.	213	122	202	309	507	608
	4	6	8	2	2	2
6.	224	212	122	222	102	202
	3	5	7	8	9	6

Name multiplier, product, and multiplicand in examples 4 to 6.

TO THE TEACHER. Make no attempt to explain the process of "carrying" at this stage. Later, lead the pupil to discover the reason himself.

7. Count by 2's from 2 to 24.

8. 2 is contained in 5 how many times, and how many over? in 6? in 7? in 9? in 13? in 11? in 25?

STUDY RECITATION

9. Divide: $2\overline{)546}$ 273

2 in 5, 2 times and 1 over. Write the 2 under the 5 and think of 1 as placed before the 4, making 14.
2 in 14, 7 times. Write the 7 under the 4.
2 in 6, 3 times. Write the 3 under the 6.

Test. $2 \times 273 = 546$.

10. Divide: $2\overline{)974}$ 487

2 in 9, 4 times and 1 over.
2 in 17, 8 times and 1 over.
2 in 14, 7 times.

11. Divide: $2)\underline{\$6.04}$ $\$3.02$

2 in 6, 3 times.
2 in 0, 0 times.
2 in 4, 2 times.
Place the point under the point in the dividend.

12. Divide: $2)\underline{618}$ 309

2 in 6, 3 times.
2 in 1, 0 times and 1 over.
2 in 18, 9 times.

13. Divide: $2)\underline{900}$ 450

2 in 9, 4 times and 1 over.
2 in 10, 5 times.
2 in 0, 0 times.

Divide and test:

	a	*b*	*c*	*d*	*e*
14.	2)532	2)148	2)698	2)746	2)$2.54
15.	2)718	2)350	2)894	2)906	2)$4.08
16.	4)804	3)603	2)786	2)574	2)$7.92
17.	2)1574	2)1200	2)700	2)408	2)$5.00
18.	2)908	2)318	2)728	2)1606	2)$8.00
19.	2)416	2)614	2)812	2)$6.16	2)$8.16
20.	2)406	2)318	2)608	2)$8.16	3)$6.00
21.	5)510	4)800	2)518	3)$6.30	2)$5.20

DRAWING TO SCALE

1 inch

2 inches

$2\frac{1}{2}$ inches

1. If each of these lines is drawn so that 1 inch represents 1 foot, how many feet does the first line represent? the second line? the third line?

As 1 inch represents 1 foot, 2 inches represent 2 feet, and $2\frac{1}{2}$ inches, $2\frac{1}{2}$ feet.

These lines are said to be drawn on a **scale** of 1 inch to 1 foot.

On a scale of 1 inch to 1 foot, draw figures to represent the following objects:

2. A tablecloth 8 feet long and 5 feet wide.
3. A cushion top 3 feet long and 2 feet wide.
4. A shelf 4 feet long and 2 feet wide.
5. A picture frame 5 feet long and $2\frac{1}{2}$ feet wide.
6. A window 5 feet long and $4\frac{1}{2}$ feet wide.

On a scale of 1 inch to 1 yard, draw figures to represent the following objects:

7. A rug 4 yards long and 4 yards wide.
8. A bookcase 2 yards long and 1 yard wide.
9. A room 5 yards long and 4 yards wide.
10. A blackboard 2 yards long and $1\frac{1}{2}$ yards wide.
11. A doorway 2 yards long and 2 yards wide.
12. Calculate the distances around the objects in examples 2, 3, 4, 7, 8, 9, and 11.

REVIEW

Write the following numbers and find their sum:

1. One hundred fifty-seven, one thousand, nine hundred eighty-four, nine hundred seven.

2. Eight hundred, four hundred seven, nine thousand seven hundred nine, three hundred one, one hundred six, nine thousand four hundred sixty-three.

3. Eight thousand one hundred fifty-seven, seven hundred sixty-nine, four thousand five hundred seventy, twenty-seven, eight thousand sixty.

Write the following amounts and find their sum:

4. One dollar and eighty-five cents, seven dollars and twenty-eight cents, five dollars and thirty-six cents, seventy-five cents, nine dollars and fifteen cents.

5. Twenty-seven dollars and fifteen cents, nineteen dollars and eighteen cents, fifteen dollars and five cents, sixty-five dollars and twenty cents, ten dollars and ten cents, three hundred four dollars and nine cents.

6. Nine dollars and eighty-eight cents, seven dollars and nine cents, sixteen dollars and twenty-seven cents, forty dollars and eighteen cents, eighteen dollars and twenty-eight cents, sixteen dollars and five cents.

Subtract, and test your work by addition:

7.	8.	9.	10.	11.	12.
875	629	931	872	1274	1856
249	243	436	394	856	989

13. William had a quarter of a dollar. He spent 5¢ for a lead pencil and 8¢ for paper. How many cents had he left?

14. A farmer had 18 chickens. He sold 4 of them to one man and 8 to another. How many had he left?

15. Mary lives 6 blocks from the schoolhouse, and Susan lives twice as many blocks from the schoolhouse. How many blocks does each have to go in going to school and returning home?

16. John lives 20 blocks away from school and Arthur half as far away. How far away does Arthur live?

17. A boy is 18 years old. His sister is $\frac{1}{2}$ as old. How old is she? What is the sum of their ages? How many years older is the boy than his sister?

18. Two boys went out to gather walnuts; one found 75 and the other 63. How many did both get? They agreed that each should have one half the whole number. How many should each have?

19. A man has 24 rows of corn to hoe. He hoes 8 rows the first hour and 6 rows the second hour. How many rows remain to be hoed?

20. Another man has 10 rows of corn to hoe. If he hoes $\frac{1}{2}$ of them the first hour, how many must he hoe the second hour to finish the job?

21. If a man walks 16 miles in one day and 18 miles the second day, in the same direction, how far will he be from his starting point?

22. If a man has traveled 34 miles from home and returns $\frac{1}{2}$ the distance, how far will he still have to go?

23. If Ella darns 10 stockings on Monday, 8 on Tuesday, and on Wednesday $\frac{1}{2}$ as many as on Monday and Tuesday, how many will she darn on Wednesday?

24. How much will 8 pencils cost at 2¢ each?

25. How much will 18 pencils cost at 2¢ each?

26. How much will 228 sheets of blotting paper cost at 2¢ a sheet?

27. How much will 2 melons cost at 8¢ each?

28. How much will 22 melons cost at 8¢ each?

To the Teacher. Pupils have learned the product of 2 and any other digit, and can therefore multiply any number whose digits are 2's by any other digit.

29. How much will 222 oranges cost at 5¢ each?

30. Divide: 2)862 2)854 2)946 2)708 2)214

31. Find the sum of the numbers in columns *D* and *E*, on p. 48. Find the difference between these sums.

32. 2 is contained in each of the following numbers how many times and how many over? 9, 8, 10, 11, 14, 15, 17, 19, 16, 12, 7, 4, 6?

Add:

33.	34.	35.	36.
$ 15.25	$ 3.08	$.07	$ 780.08
8.07	14.26	3.00	126.30
.34	20.01	19.08	.09
1.08	30.03	27.56	2.76

Read the numbers in each of the following examples. Add upwards and test the result by adding downwards:

	a	*b*	*c*	*d*
37.	6239	6500	6072	7010
	4407	2007	9847	49
	8310	8000	9009	863
	9847	6302	6370	1702
	6009	5720	8008	4086

Add, and test by subtracting from each sum the first number above it, and from that remainder the second number, etc. The last remainder should equal the first number.

38.	1520	3056	7890	1000
	2709	8759	2947	2795
	1526	7006	6478	3847

Subtract:

39.	$215.80	$693.48	$207.04	$478.75
	196.27	179.65	194.28	293.87

Add. Read the amounts given in each example and read the sum:

40.	$2.75	$10.05	$15.70	$215.20
	.87	18.20	27.83	109.09
	.05	10.76	19.06	200.08
	19.06	.85	27.48	300.15
	2.70	.09	95.65	406.27

PART THREE

TABLE OF THREES

Beginning with 3, add by 3's to 36.

Learn:

$3 \times 1 = 3$	$3 \times 5 = 15$	$3 \times 9 = 27$
$3 \times 2 = 6$	$3 \times 6 = 18$	$3 \times 10 = 30$
$3 \times 3 = 9$	$3 \times 7 = 21$	$3 \times 11 = 33$
$3 \times 4 = 12$	$3 \times 8 = 24$	$3 \times 12 = 36$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1.	$9 \div 3 = ?$	$\frac{1}{3}$ of $9 = ?$	$\frac{2}{3}$ of $9 = ?$
2.	$12 \div 3 = ?$	$\frac{1}{3}$ of $12 = ?$	$\frac{1}{4}$ of $12 = ?$
3.	$15 \div 3 = ?$	$\frac{1}{3}$ of $15 = ?$	$\frac{1}{5}$ of $15 = ?$
4.	$18 \div 3 = ?$	$\frac{1}{3}$ of $18 = ?$	$\frac{1}{6}$ of $18 = ?$
5.	$21 \div 3 = ?$	$\frac{1}{3}$ of $21 = ?$	$\frac{1}{7}$ of $21 = ?$
6.	$24 \div 3 = ?$	$\frac{1}{3}$ of $24 = ?$	$\frac{1}{8}$ of $24 = ?$
7.	$27 \div 3 = ?$	$\frac{1}{3}$ of $27 = ?$	$\frac{1}{9}$ of $27 = ?$
8.	$30 \div 3 = ?$	$\frac{1}{3}$ of $30 = ?$	$\frac{1}{10}$ of $30 = ?$
9.	$33 \div 3 = ?$	$\frac{1}{3}$ of $33 = ?$	$\frac{1}{11}$ of $33 = ?$
10.	$36 \div 3 = ?$	$\frac{1}{3}$ of $36 = ?$	$\frac{1}{12}$ of $36 = ?$

11. Count by 3's from 3 to 36.

12. Three 3's = ? 9 = how many 3's?

13. Eight 3's = ? 12 = how many 4's?

14. Twelve 3's = ? 15 = how many 3's?

15. Nine 3's = ? 30 = how many 3's?

16. Seven 3's = ? 24 = how many 3's?

17. Eleven 3's = ? 27 = how many 9's?

18. Four 3's = ? 33 = how many 3's?

19. Six 3's = ? 36 = how many 12's?

20. Five 3's = ? 18 = how many 3's?

21. Ten 3's = ? 21 = how many 7's?

22.	$18 \div 6 = ?$	$15 \div 3 = ?$	$\frac{1}{3}$ of $27 = ?$
23.	$27 \div 3 = ?$	$24 \div 8 = ?$	$\frac{1}{9}$ of $27 = ?$
24.	$12 \div 4 = ?$	$36 \div 3 = ?$	$\frac{1}{5}$ of $15 = ?$
25.	$30 \div 3 = ?$	$21 \div 7 = ?$	$\frac{1}{6}$ of $18 = ?$
26.	$33 \div 11 = ?$	$18 \div 3 = ?$	$\frac{1}{3}$ of $33 = ?$
27.	$9 \div 3 = ?$	$24 \div 3 = ?$	$\frac{1}{3}$ of $21 = ?$
28.	$27 \div 9 = ?$	$36 \div 12 = ?$	$\frac{1}{7}$ of $21 = ?$
29.	$\frac{1}{3}$ of $24 = ?$	$\frac{1}{10}$ of $30 = ?$	$\frac{1}{3}$ of $36 = ?$

PROBLEMS

ORAL

1. If a man earns $2 a day for 3 days, how many dollars does he earn?

2. If 9 jars of lemon jelly are equally divided among 3 girls, how many will each get?

3. If a man earns $8 in 4 days, how many dollars does he earn in 1 day?

4. If a man works a number of days at $2 per day and receives $10, how many days does he work?

5. If from 3 pecks of oats I feed a horse 6 quarts, how many quarts have I left?

ANALYSIS: How many quarts equal 3 pecks? Answer: —— quarts. 6 quarts from 24 quarts leaves how many quarts? Answer: —— quarts.

6. If a girl buys 3 pieces of ribbon 3 yards long, how many feet of ribbon does she buy? Analyze.

7. **1 yard = 36 inches.** $\frac{1}{12}$ of a yard = how many inches? $\frac{3}{12}$ of a yard = how many inches? $\frac{1}{3}$ of a yard = how many inches? $\frac{2}{3}$ of a yard?

8. **1 yard = 3 feet.** How many feet = $\frac{2}{3}$ of a yard? 2 feet = how many inches?

WRITTEN

Multiply:

9.	10.	11.	12.	13.	14.	15.	16.
62	73	81	92	63	803	$852.31	$43.02
3	3	3	3	3	3	3	3

Prove that your answers are correct by dividing each answer by 3.

17. How much will 33 tons of coal cost at $3 a ton? Prove.

18. A man travels 43 miles an hour by rail. How many miles will he travel in 3 hours? Prove.

19. If a man travels 39 miles in a certain number of hours, how far will he travel in $\frac{1}{3}$ of that time? How do you find $\frac{1}{3}$ of a number? Use 10, 7, and 12 in place of a "certain number," to show that the number of hours makes no difference in the result.

DRILL

To the Teacher. This drill in dividing by 3, numbers between 3 and 36 that are not multiples of 3, is a preparation for dividing larger numbers by 3. The greatest difficulty pupils have in short division is in finding the quotient figure when the partial dividend is not exactly divisible by the divisor. If the work below is thoroughly mastered, they will have no trouble in dividing by 3. Similar work should be given with each table.

1. Count by 3's from 3 to 36. Beginning with 36, give in reverse order the numbers exactly divisible by 3; thus, 36, 33, etc.

2. What is the first number smaller than 8 that contains 3 exactly? the first number smaller than 10 that contains 3 exactly? than 13? 11? 19? 14? 17? 16? 34? 20? 26? 22? 25? 31? 23? 32? 28? 37? 29? 35?

3. 3 is contained in 7 how many times and how many are left over? 3 in 8? in 10? in 11? in 12? in 15? in 13? in 14?

4. 3 in 18? in 16? in 17? in 21? in 20? in 24?

5. 3 in 22? in 23? in 19? in 27? in 30? in 25?

6. 3 in 28? in 26? in 29? in 35? in 32? in 34?

WRITTEN MULTIPLICATION

STUDY RECITATION

1. Multiply:

$$\begin{array}{r} 428 \\ \times\ 3 \\ \hline 1284 \end{array}$$

$3 \times 8 = 24$. Write the 4 under the 8.

$3 \times 2 = 6$. Carry, or add, the 2 in the 24, to 6, making 8. Write the 8 at the left of the 4 and under the 2.

$3 \times 4 = 12$. As this is the last product, write it at the left of the 8.

2. Multiply:

$$\begin{array}{r} \$5.67 \\ \times\ 3 \\ \hline \$17.01 \end{array}$$

$3 \times 7 = 21$. Write the 1 under the 3.

$3 \times 6 = 18$. Carry, or add, the 2 in the 21, to 18, making 20. Write the 0 at the left of the 1 and under the 6. Write the point at the left of the 0.

$3 \times 5 = 15$. Carry, or add, the 2 in the 20, to 15, making 17. As this is the last part of the product, write it at the left of the 0.

3. Multiply:

$$\begin{array}{r} 6009 \\ \times\ 3 \\ \hline 18027 \end{array}$$

$3 \times 9 = 27$. Write the 7 under the 3.

$3 \times 0 = 0$. Add the 2 in the 27 to 0, making 2. Write the 2 at the left of the 7 and under the first 0.

$3 \times 0 = 0$. As there is nothing to carry, write the 0 at the left of the 2 and under the second 0.

$3 \times 6 = 18$. As this is the last part of the product, write it at the left of the 0.

WRITTEN

4.	5.	6.	7.	8.	9.
824	678	739	$8.46	$5.94	$2.75
× 3	× 3	× 3	× 3	× 3	× 3

STUDY RECITATION

1. Divide: 3)1710
570

3 in 17, 5 times and 2 over. Place the 5 under the 7. Think of 2 as placed before the 1, making it 21. 3 in 21, 7 times. Place the 7 under the 1. 3 in 0 no times. Place the naught or zero under the zero.

Test. $3 \times 570 = 1710$.

Divide and test:

	a	*b*	*c*	*d*	*e*	*f*
2.	3)870	3)1212	3)657	3)621	3)$3.93	3)$6.90
3.	3)633	3)1803	3)9150	3)624	3)$9.69	3)$6.93

4. There are 135 pupils in 3 rooms. If $\frac{1}{3}$ of them are in each room, how many are there in each room?

5. A man has 240 acres in his farm. On $\frac{1}{3}$ of it he raises wheat. How many acres of wheat has he?

WRITTEN

Multiply:

	a	*b*	*c*	*d*	*e*	*f*
6.	235 × 3	446 × 3	255 × 3	864 × 3	$7.52 × 3	$2.34 × 3
7.	476 × 3	879 × 3	486 × 3	647 × 3	$7.84 × 3	$6.97 × 3

REVIEW

Oral

1. If 1 cord of wood costs $7, how much do 3 cords cost? 2 cords?

2. If 2 horses eat 3 pecks of oats in 1 day, how many quarts does each eat? What part of the whole amount does each horse eat?

3. A man pays $15 an acre for 3 acres of land. How many dollars does he pay for the land?

4. How much will 4 quarts of milk cost, at 3¢ a pint?

5. Lucy has 6 yards of ribbon. What is its length in feet? She wants to cut the ribbon so as to make 9 bows, each having the same length of ribbon. How many feet long will each piece be?

6. 18 pieces of cardboard are to be divided among three children. If the first gets $\frac{1}{2}$ of them, the second $\frac{1}{3}$ of them, and the third what are left, how many does the third get?

7. 3 is what part of 9? of 12? of 15? of 21?

8. 6 dusters are how many times 2 dusters? If 2 dusters cost 10¢, how much will 6 dusters cost?

9. If carpet is 1 yard wide, how many strips laid side by side will it take to cover a floor 24 feet wide?

Draw a figure on the blackboard showing the number of strips.

10. Each of the following numbers is how many times 3, and how many over? 7, 8, 9, 12, 31, 34?

TABLE OF FOURS

Beginning with 4, add by 4's to 48.

Learn:

$4 \times 1 = 4$	$4 \times 5 = 20$	$4 \times 9 = 36$
$4 \times 2 = 8$	$4 \times 6 = 24$	$4 \times 10 = 40$
$4 \times 3 = 12$	$4 \times 7 = 28$	$4 \times 11 = 44$
$4 \times 4 = 16$	$4 \times 8 = 32$	$4 \times 12 = 48$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1.	$16 \div 4 = ?$	$\frac{1}{4}$ of $16 = ?$	$\frac{3}{4}$ of $16 = ?$
2.	$20 \div 4 = ?$	$\frac{1}{4}$ of $20 = ?$	$\frac{1}{5}$ of $20 = ?$
3.	$24 \div 4 = ?$	$\frac{1}{4}$ of $24 = ?$	$\frac{1}{6}$ of $24 = ?$

TO THE TEACHER. Give similar drill on remaining multiples of 4, to 48.

4. Count by 4's from 4 to 48.
5. Eight 4's = ? 16 = how many 4's?
6. Twelve 4's = ? 20 = how many 4's?
7. Nine 4's = ? 24 = how many 6's?

TO THE TEACHER. Continue similar drill.

8.	$24 \div 6 = ?$	$40 \div 10 = ?$	$\frac{1}{4}$ of $36 = ?$
9.	$36 \div 9 = ?$	$28 \div 4 = ?$	$\frac{1}{9}$ of $36 = ?$
10.	$32 \div 4 = ?$	$48 \div 4 = ?$	$\frac{1}{4}$ of $40 = ?$
11.	$44 \div 11 = ?$	$40 \div 4 = ?$	$\frac{1}{4}$ of $28 = ?$
12.	$20 \div 5 = ?$	$48 \div 12 = ?$	$\frac{1}{10}$ of $40 = ?$

13.	$12 \div 4 = ?$	$\frac{1}{4}$ of $12 = ?$	$\frac{1}{4}$ of $32 = ?$
14.	$36 \div 4 = ?$	$44 \div 11 = ?$	$\frac{1}{7}$ of $28 = ?$
15.	$32 \div 8 = ?$	$28 \div 7 = ?$	$\frac{1}{11}$ of $44 = ?$

16. Give in order all the products of 4 to 48.

PROBLEMS AND EXAMPLES

Oral

1. A boy earns \$2 a week by selling papers His brother earns 4 times as many dollars as a clerk. How many dollars does his brother earn?

2. If Mary earns \$16 a week and her sister earns $\frac{1}{4}$ as much, how much does her sister earn?

3. A man sells 10 cords of wood and receives in payment 4 five-dollar bills. How much does he receive? How much does he receive for 1 cord? for 3 cords?

4. If I divide \$44 equally among some men, giving each \$4, how many men are there? How much is $\frac{1}{4}$ of \$44? How many times \$4 is \$44?

5. How many times can I take 4 bushels from 36 bushels?

6. How many times can I fill a gallon measure from a vessel holding 32 quarts?

7. How many yards equal 36 feet?

8. Make a problem using the numbers 4 and 48 and the words *dollars* and *men*. Solve it.

9. I have a stick 9 feet long. How many times must I lay it off on the ground to measure 36 feet? 27 feet? 18 feet?

10. 2 is what part of 12? 4 is what part of 12? 8 is what part of 12?

11. 4 is what part of 16? 32 is how many times 8?

12. What part of 28 is 7? 33 is how many times 11? 24 is how many 8's?

13. Count by 4's from 4 to 48.

See Note to Teacher, p. 100.

14. 4 is contained how many times, and how many over in: 12, 16, 15, 13, 14, 23, 21?

15. Divide by 4: 28, 35, 27, 36, 20, 24, 18, 19, 17, 32, 34, 33, 48, 44, 45, 47, 42, 39, 29?

WRITTEN

Multiply, and prove by adding. Thus, $232+232+232+232=928$.

16.	17.	18.	19.	20.	21.	22.
232	156	632	584	$3.27	$4.42	$5.61
4	4	4	4	4	4	4

Divide, and prove by multiplying the quotient by the divisor:

23.	24.	25.	26.	27.	28.
4)484	4)1288	4)1648	4)1764	4)$25.80	4)$37.28

29. A farmer has 248 sheep. His son has $\frac{1}{4}$ as many. How many has his son?

30. Another farmer has 4 times 62 sheep. How many sheep has this farmer? How many have all three?

31. If a pile of wood contains 136 cords, how many cords will there be in $\frac{1}{4}$ of the pile? in $\frac{1}{2}$ of the pile?

32. A woman pays \$ 7.12 for a dress skirt and $\frac{1}{4}$ as much for a pair of gloves. How much does she pay for both?

33. On a shelf in a classroom there are 16 rows of boxes, 4 boxes in each row. How many are there in all?

34. I have 30 nails in one box, 10 in another, and 8 in another, which are to be divided equally among 4 boys. How many nails will each boy receive?

35. John had 50 cents. After spending 14 cents for himself, he divided the remainder equally among his 4 sisters. How many cents did each sister get?

Divide and prove:

	a	*b*	*c*	*d*	*e*	*f*
36.	4)968	4)724	4)504	4)692	4)780	4)2836
37.	4)\$ 5.00	4)\$ 6.04	4)\$ 7.08	4)\$ 8.08	4)\$ 9.00	
38.	4)528	4)760	4)408	4)928	4)368	4)6480

TABLES OF FIVES

Beginning with 5, add by 5's to 60.

Learn:

$5 \times 1 = 5$	$5 \times 5 = 25$	$5 \times 9 = 45$
$5 \times 2 = 10$	$5 \times 6 = 30$	$5 \times 10 = 50$
$5 \times 3 = 15$	$5 \times 7 = 35$	$5 \times 11 = 55$
$5 \times 4 = 20$	$5 \times 8 = 40$	$5 \times 12 = 60$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1.	$25 \div 5 = ?$	$\frac{1}{5}$ of $25 = ?$	$\frac{2}{5}$ of $25 = ?$
2.	$30 \div 5 = ?$	$\frac{1}{5}$ of $30 = ?$	$\frac{1}{6}$ of $30 = ?$
3.	$35 \div 5 = ?$	$\frac{1}{5}$ of $35 = ?$	$\frac{1}{7}$ of $35 = ?$

TO THE TEACHER. Continue the drill with other multiples of 5, to 60.

4. Subtract by 5's from 60.
5. Eight 5's = ? In 30 how many 5's?
6. Twelve 5's = ? In 35 how many 5's?
7. Nine 5's = ? In 60 how many 5's?

TO THE TEACHER. Continue the drill.

8.	$\frac{1}{5}$ of $50 = ?$	$\frac{1}{9}$ of $45 = ?$	$\frac{1}{5}$ of $60 = ?$
9.	$\frac{1}{6}$ of $30 = ?$	$\frac{1}{5}$ of $45 = ?$	$\frac{1}{8}$ of $40 = ?$
10.	$\frac{1}{11}$ of $55 = ?$	$\frac{1}{7}$ of $35 = ?$	$\frac{1}{10}$ of $50 = ?$
11.	$\frac{1}{5}$ of $30 = ?$	$\frac{1}{5}$ of $35 = ?$	$\frac{1}{12}$ of $60 = ?$
12.	$\frac{1}{4}$ of $20 = ?$	$\frac{1}{5}$ of $40 = ?$	$\frac{1}{5}$ of $55 = ?$

PROBLEMS AND EXAMPLES

Oral

1. Five nickels equal how many cents?

2. Five dimes equal what part of a dollar?

3. In 5 weeks how many days are there?

4. A boy has a kite string 45 yards long. If $\frac{1}{9}$ of the string is broken off, how many yards are left?

5. A flower bed is 5 feet wide. If it is 5 times as long as it is wide, what is its length?

6. If a dozen spools of thread cost 60¢, what is the cost of 1 spool? of 3 spools?

7. If there are 4 cups of baking powder to a 2-pound can, how many cups are there to a 5-pound can?

See Note to Teacher, p. 100.

How many times, and how many over, is 5 contained in the following numbers?

8. 20, 21, 24, 25, 35, 37, 39, 40, 45, 42, 44, 60, 54.

9. 58, 55, 57, 59, 48, 38, 29, 19, 43, 33, 46, 27, 41.

Written

Multiply:

10.	11.	12.	13.
25	126	$8.47	$6.29
5	5	5	5

Divide and prove:

14.	15.	16.	17.	18.	19.	20.
5)5280	5)6375	5)4220	5)5205	5)$50.50	5)$51.05	5)$10.40

21. A man divides \$ 20 (\$ 5800) among his wife and 4 children, giving each the same amount. How many dollars will each have? First solve the problem using \$ 20; then use \$ 5800?

22. A man earns \$ 70 a month and spends \$ 50 a month. How much does he save in 5 months?

23. A man travels 96 miles in 3 days. At the same rate how far will he travel in 5 days? What is the first question to be answered?

24. A man saves \$ 165, saving \$ 5 a week. How many weeks does it take him?

25. A piece of cloth is 60 yards long. $\frac{1}{12}$ of it is sold for \$ 3 a yard, and $\frac{1}{5}$ of it for \$ 2 a yard. How much is received for each part? for both parts?

26. A man has 12 horses. He keeps 7 of them and sells the remainder at \$ 75 a head. How much does he get for them?

Add:

27.	28.	29.	30.	31.	32.
4728	27	273	189	\$ 6.43	\$ 1.69
1365	49	146	973	7.52	4.78
4237	38	352	468	8.56	9.86
3856	64	437	572	4.79	7.48

Subtract:

33.	34.	35.	36.	37.	38.
6000	4020	5203	8401	\$ 71.11	\$ 90.20
1589	3678	2449	5674	65.67	79.99

TABLE OF SIXES

Add by 6's from 6 to 72.

Learn:

$6 \times 1 = 6$	$6 \times 5 = 30$	$6 \times 9 = 54$
$6 \times 2 = 12$	$6 \times 6 = 36$	$6 \times 10 = 60$
$6 \times 3 = 18$	$6 \times 7 = 42$	$6 \times 11 = 66$
$6 \times 4 = 24$	$6 \times 8 = 48$	$6 \times 12 = 72$

Table for Drill in giving Products and Quotients Rapidly

1. $36 \div 6 = ?$ $\frac{1}{6}$ of $36 = ?$ $\frac{2}{6}$ of $36 = ?$
2. $42 \div 6 = ?$ $\frac{1}{6}$ of $42 = ?$ $\frac{1}{7}$ of $42 = ?$
3. $48 \div 6 = ?$ $\frac{1}{6}$ of $48 = ?$ $\frac{1}{8}$ of $48 = ?$

To the Teacher. Continue the drill.

4. Count by 6's from 6 to 72.
5. Eight 6's = ? In 48 how many 6's?
6. Twelve 6's = ? In 72 how many 6's?
7. Nine 6's = ? In 60 how many 6's?

To the Teacher. Continue the drill.

8. $\frac{1}{6}$ of $24 = ?$ $\frac{1}{6}$ of $72 = ?$ $\frac{1}{10}$ of $60 = ?$
9. $6 \times 7 = ?$ $11 \times 6 = ?$ $9 \times 6 = ?$
10. $6 \times 6 = ?$ $\frac{1}{6}$ of $54 = ?$ $\frac{1}{12}$ of $72 = ?$
11. $\frac{1}{11}$ of $66 = ?$ $6 \times 12 = ?$ $\frac{1}{5}$ of $30 = ?$

12. $\frac{1}{6}$ of 12 = ? $\frac{1}{6}$ of 18 = ? $\frac{1}{3}$ of 18 = ?

13. $10 \times 6 = ?$ $6 \times 5 = ?$ $4 \times 6 = ?$

14. $66 \div 6 = ?$ $54 \div 9 = ?$ $30 \div 6 = ?$

15. $\frac{1}{4}$ of 24 = ? $\frac{1}{6}$ of 66 = ? $\frac{1}{6}$ of 60 = ?

16. 8 can be taken from 48 how many times?

17. 11 can be taken from 66 how many times?

18. 6 can be taken from 72 how many times?

19. 6 can be taken from 36 how many times?

20. 6 can be taken from 42 how many times?

21. Beginning with 1, count by 6's to 73.

22. Beginning with 3, count by 6's to 75.

23. Beginning with 4, count by 6's to 52.

24. Beginning with 8, count by 6's to 62.

EXAMPLES AND PROBLEMS

Oral

1. Give the products of the following numbers by 6: 5, 2, 7, 9, 12, 8, 11, 3, 4, 6, 9, 10, 12.

2. Give one sixth of the following numbers: 24, 18, 12, 30, 42, 54, 48, 60, 72, 66, 36.

3. If you write 4 rows of numbers, 6 numbers in each row, how many numbers do you write in all?

4. If 6 hills of corn are planted 4 feet apart in a row, how many feet are there between the end hills? Show this by a diagram on the board drawn on a scale of 1 inch to 1 foot.

5. John has 6 times as much money as James, who has 7 cents. How much more money has John than James? The first question to be answered is what?

6. There are **24 hours in a day.** From 3 o'clock until 9 o'clock is what part of the day? How many hours is it from 3 o'clock until 9 o'clock?

7. At 6 cents a quart, what will be the cost of 1 gallon of milk? of 3 gallons? of 4 gallons? of $\frac{1}{2}$ gallon? of $\frac{1}{4}$ gallon?

8. A boy borrows 60 cents from his brother, and pays it to him at 12 cents a week. In how many weeks is the debt paid?

9. How many weeks would it take to pay a debt of 60 cents if it was paid at the rate of 6 cents a week?

10. A farmer sells 6 calves at $7 apiece, and 5 sheep at $2 apiece. How much does he receive for the calves? How much does he receive for the sheep? How much does he receive for the sheep and calves?

11. If buttons sell at 12 cents a dozen, how many can I buy for 60 cents?

12. How much will half a dozen buttons cost at 12 cents a dozen?

13. At 12 cents a dozen, how many dozen buttons can I buy for 72 cents? how many half dozen?

14. A man employs 6 clerks at $5 a week and 3 clerks at $10 a week. How much does he pay them all per week?

15. A room is 10 yards long and 6 yards wide. What is the distance around it in yards?

16. Give $\frac{1}{12}$ of the following numbers:
24, 48, 36, 60, 72.

17. Give $\frac{3}{12}$ of the same numbers; $\frac{5}{12}$ of them; $\frac{7}{12}$ of them.

18. Add by 6's from 6 to 72.

19. Subtract by 8's from 48. Add by 8's from 8 to 48.

If a number will not exactly divide another number, what is left may be written as follows:

20. $6)\overline{49}$ $\quad 8\frac{1}{6}$ — 6 in 49 eight times and 1 over. Write 1 over the 6 at the right of the 8. Read the answer, $8\frac{1}{6}$, eight and one sixth.

21. $12)\overline{38}$ $\quad 3\frac{2}{12}$ — 12 in 38 three times and 2 over. Write it $3\frac{2}{12}$. Read the answer, three and two twelfths.

The **remainder** is the part left over when the division is not exact.

22. Subtract by 6's from 72.

See Note to Teacher, p. 100.

23. Divide each of the following numbers by 6:
36, 39, 45, 47, 50, 54, 56, 60, 65, 68, 71, 25, 19, 17, 13.

24. Add by 9's to 54.

25. Divide each of the following numbers by 9:
19, 28, 37, 47, 56, 58, 17, 13, 22, 38, 48, 31, 49, 52.

26. Add by 8's from 8 to 48.

27. Divide each of the following numbers by 8:
40, 44, 32, 36, 34, 27, 29, 35, 43, 38, 27, 39, 45, 28.

28. Multiply 11 by 6 and divide the product by 5. Which number is the multiplicand? Which is the multiplier? Which is the product? Which is the divisor? Which is the dividend? Which is the remainder?

WRITTEN

Divide the following numbers and prove:

	a	*b*	*c*	*d*	*e*
29.	6)216	6)726	6)594	6)678	6)2406

Divide and give the remainders:

30. 6)283 6)5633 6)3025 6)4612 6)3892

31. 6)364 6)542 6)7265 6)3023 6)3654 6)4339

32. If a man pays 28 cents for each of 6 chickens, how much does he pay for all?

33. A man earns 26 dollars a month. How much does he earn in 9 months? How much more would he earn in a year than in 9 months?

34. If a man's salary is $ 987 a year, how much will it be for 6 years?

35. A salesman sells three pianos: the first for $ 245; the second for three times as much; and the third for $ 150 less than the second. How much does he receive for all the pianos?

MULTIPLIERS OF TWO FIGURES

Study Recitation

1. Multiply:

267
23
801
534
6141

Multiply by 3; the product is 801.

Multiply by 2 (tens); 2 times 7 is 14. Write the 4 in tens' column under the 0 and the 2 of the multiplier. Add the 1 to 2 times 6, making 13. Write the 3 at the left of the 4, under the 8. Add the 1 to 2 times 2, making 5. Place the five at the left of the 3.

Each of the two products is called a **partial product.** Add the two partial products. The product is 6141.

Written

Multiply:

2.	3.	4.	5.	6.	7.
256	327	234	505	$7.29	$3.84
24	32	26	16	25	46

PROBLEMS

Oral and Written

1. If a furniture dealer buys 6 chairs at $2.75 each and 4 tables at $9 each, how much is his bill?

2. How much will 24 cups cost at 6 cents each?

3. If a carpet costs $3 ($2.25) a yard, how much will 6 (26) yards cost?

Note. When numbers occur in *parenthesis* in a problem, like ($2.25) and (26) in this problem, first solve the problem, using the numbers before the parenthesis, and then solve, using the numbers in the parenthesis. The first problem to be solved is: If a carpet costs $3 a yard, how much will 6 yards cost? The second

problem is: If a carpet costs $2.25 a yard, how much will 26 yards cost?

4. In a class in woodworking there are 36 pupils. If each buys a chisel at 35 cents, how much do they all pay for their chisels?

5. If each girl in a sewing class of 16 pupils buys a workbag at 20 cents, how much do the workbags cost?

6. If the reed for the baskets made in a class of 29 pupils costs 16 cents for each pupil, how much does it cost for the class?

7. There are 6 kegs of nails each weighing 125 pounds; and the kegs that contain the nails weigh 8 pounds. Make two problems from these statements and solve each.

8. A man buys 26 bushels of potatoes at 75 cents a bushel, and gives in payment a 20-dollar bill. How much change should he get?

9. At the rate of 8 oranges for 24 cents, what will be the cost of 16 oranges? of two dozen oranges? of four dozen oranges? Four dozen is how many times 8? What is the first question to be answered?

10. A man saves $504 in 6 months. How many dollars does he save each month? Counting four weeks to a month, how much does he save each week?

11. A merchant's sales in 6 years amounted to $89,460. What were his sales per year?

12. If the materials for each girl in a sewing class cost $2.75, find the cost of materials for 26 girls.

Find the cost of 26 bushels of each of the following:

13. Potatoes @ 75¢

14. Beans @ $1.25

15. Corn @ 46¢

16. Apples @ $2.20

17. A teacher desires to put 62 pupils into seven classes. She puts 9 pupils in each of 6 classes. How many must she put in the seventh class?

18. There are 180 lines on 6 pages. How many lines are there on 1 page? on 5 pages?

19. If there are 120 lines on 6 pages, how many lines are there on 3 pages? What is the first question to be answered? the second?

20. A seamstress earns $12 a week and spends $4 a week for board and $2 a week for other expenses. In how many weeks will she save $36? Ask and answer three questions in working this problem.

DRILL IN ADDITION

Oral

Add rapidly to each of the following numbers first 5; then 8; then 7; 6; 4; 3; 9; 2:

1. 17, 27, 34, 54, 63, 73, 48, 68, 56, 26, 35, 75, 33.
2. 22, 62, 49, 79, 28, 46, 53, 19, 16, 37, 45, 18, 13.
3. 86, 72, 84, 93, 64, 89, 88, 31, 61, 24, 82, 43, 23.

TABLE OF SEVENS

Add by 7's from 7 to 84.

Learn:

$7 \times 1 = 7$	$7 \times 5 = 35$	$7 \times 9 = 63$
$7 \times 2 = 14$	$7 \times 6 = 42$	$7 \times 10 = 70$
$7 \times 3 = 21$	$7 \times 7 = 49$	$7 \times 11 = 77$
$7 \times 4 = 28$	$7 \times 8 = 56$	$7 \times 12 = 84$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1.	$49 \div 7 = ?$	$\frac{1}{7}$ of $49 = ?$	$\frac{2}{7}$ of $49 = ?$
2.	$56 \div 7 = ?$	$\frac{1}{8}$ of $56 = ?$	$\frac{1}{7}$ of $56 = ?$

TO THE TEACHER. Continue the drill.

3. Count by 7's from 7 to 84.
4. Eight 7's = ? 12 taken 7 times = ?
5. Twelve 7's = ? 8 taken 7 times = ?

6.	$42 \div 6 = ?$	$63 \div 7 = ?$	$\frac{1}{11}$ of $77 = ?$
7.	$21 \div 7 = ?$	$84 \div 12 = ?$	$\frac{1}{7}$ of $63 = ?$
8.	$56 \div 7 = ?$	$42 \div 7 = ?$	$\frac{1}{10}$ of $70 = ?$
9.	$35 \div 5 = ?$	$28 \div 7 = ?$	$\frac{1}{12}$ of $84 = ?$
10.	$63 \div 9 = ?$	$84 \div 7 = ?$	$\frac{1}{7}$ of $49 = ?$
11.	$70 \div 7 = ?$	$35 \div 7 = ?$	$\frac{1}{7}$ of $70 = ?$
12.	$56 \div 8 = ?$	$21 \div 3 = ?$	$\frac{1}{9}$ of $63 = ?$
13.	$14 \div 7 = ?$	$70 \div 10 = ?$	$\frac{1}{7}$ of $77 = ?$

14. Beginning with 1, count by 7's to 85.

15. Beginning with each number from 2 to 7, count by 7's to the number nearest to 100.

EXAMPLES AND PROBLEMS

ORAL

1. Multiply each of the following numbers by 7: 6, 8, 9, 11, 10, 12, 4, 7, 3, 2, 5.

2. Multiply each of the following numbers by 4: 17, 12, 8, 7, 11, 9, 10, 5, 23, 34, 45, 57, 66, 40, 20, 50.

3. Give $\frac{1}{7}$ of each of the following numbers: 21, 35, 49, 28, 84, 77, 63, 70, 56, 42, 210, 350, 777.

4. Give $\frac{2}{7}$ of the same numbers; $\frac{5}{7}$ of them; $\frac{6}{7}$ of them; $\frac{3}{7}$ of them; $\frac{4}{7}$ of them.

5. Count by 7's to 84, beginning with 7; to 100, beginning with 2; to 96, beginning with 5; to 99, beginning with 8.

See Note to Teacher, p. 100.

Give results:

	a	*b*	*c*	*d*	*e*
6.	7)287	7)27	7)378	7)3528	7)$55.30
7.	7)644	7)58	7)483	7)3507	7)$55.23

8. How many days are there in 7 weeks? In 63 days how many weeks are there?

9. A man earns $56 in a certain time. Another man earns $\frac{1}{7}$ as much. How much does the second man earn?

10. A milliner trims 12 hats that cost her $5 apiece and sells them at $7 apiece. How much does she gain? Solve in two ways. Analyze.

11. A merchant sold overcoats at $12.50 that cost $10.50. How much did he gain on 7 coats? Solve in two ways. Analyze.

12. A bookseller bought 7 books at 12¢ apiece, and sold them at a gain of 3¢ apiece. For how much did he sell them? Solve in two ways. Which is the better way? Why?

13. A domestic science class bought 2 sewing machines at $25 each and 7 hot plates at $5 each. Find the total cost.

14. I pay $35 for coal at $7 a ton. How many tons do I purchase?

15. A boy buys 7 pencils for 21¢. How many can he buy for 42¢?

16. Oranges are selling at 3 for 7¢. How many can I buy for 21¢?

ANALYSIS: I can buy as many times 3 oranges as 7 is contained times in 21, or 3 times 3 oranges, which are —— oranges.

17. If oranges are selling at 3 for 5¢, how many can I buy for 20¢?

18. At 6 for 10¢ how many oranges can I buy for 20¢?

19. James had 14 chickens. He sold $\frac{2}{7}$ of them. How many did he sell? Ask another question on the same statement. Answer the question.

20. If a boy who had 70¢ paid $\frac{1}{10}$ of his money for a ruler, and $\frac{3}{7}$ of it for a chisel, how much money had he left? Ask and answer four questions in solving.

21. In an arithmetic lesson there were 21 problems. John solved $\frac{2}{3}$ of them and Henry solved $\frac{6}{7}$ of them. How many did each solve?

22. How much will $\frac{3}{4}$ of a pound of raisins cost at 28¢ a pound? How much will $\frac{1}{2}$ of a pound cost? Ask and answer another question.

23. 7 gallons of milk filled 14 pitchers of equal size. How much did each pitcher hold?

24. How many weeks are equal to 28 days? to 35 days? to 63 days?

25. How many days are there in 12 weeks? in 8 weeks?

REVIEW

1. What is $\frac{1}{8}$ of 48? $\frac{1}{12}$ of 24? $\frac{1}{7}$ of 14? $\frac{1}{6}$ of 42? $\frac{1}{9}$ of 54? $\frac{1}{11}$ of 66? $\frac{1}{5}$ of 35? $\frac{1}{12}$ of 84? $\frac{1}{12}$ of 60?

2. Find $\frac{2}{3}$ of each of the following numbers:
9, 12, 18, 15, 21, 24, 30, 27, 36, 33, 39, 60, 63, 90, 93.

3. Find $\frac{3}{4}$ of each of the following numbers:
12, 8, 16, 24, 32, 20, 36, 48, 44, 40, 28, 80, 84, 88.

4. Find $\frac{3}{7}$ of each of the following numbers:
14, 7, 28, 35, 49, 21, 56, 70, 63, 84, 42, 77, 140, 280.

5. Find $\frac{3}{8}$ of each of the following numbers:
56, 24, 16, 32, 48, 40, 8, 64, 72, 88, 80, 96, 160, 320.

6. Find $\frac{3}{12}$ of each of the following numbers:
24, 48, 36, 84, 60, 72, 12.

7. Find $\frac{3}{5}$ of each of the following numbers:
10, 15, 30, 20, 45, 25, 60, 35, 55, 40, 50.

8. Give the products of 8, 4, 12, 7, 11, 9, 6, 5, 10, 3, by 3; by 5; by 7; by 4; by 6; by 2.

9. To each of the numbers 84, 72, 69, 48, 56, 45, 37, 23, 91 add first 9; then 7; then 5; then 8; 6; 4; 3.

10. Subtract from 92, 74, 83, 65, 56, 48, 37, 59 first 8; then 7; then 5; then 6; then 3; then 4; then 9.



PROBLEMS

WRITTEN

1. If 57 pupils in a sewing class pay 25¢ each for material, how much will the whole class pay?

2. If the second grade contains 37 pupils and each pays 35¢ for materials, how much will this grade pay each year?

3. If the third grade contains 47 pupils and they pay 47¢ each for sewing materials, how much does this grade pay?

4. Using the facts stated in two or more of these problems, make two or more problems and solve them.

5. A farmer collects a bill for 27 pounds of butter at 24¢ a pound. He spends the money for fruit jars at 12¢ apiece. How many jars does he get? Work in two ways.

6. Two boys, A and B, travel in the same direction, A at the rate of 5 miles per hour and B at the rate of 3 miles per hour. If they start from the same point at the same time, how soon will A be 14 miles ahead of B?

How far would A be ahead of B at the end of 1 hour? Show by diagram on the board. What is the next question to be answered in solving this problem?

7. If two boys travel in opposite directions, at the same rates as in problem 6, how far apart will they be in 1 hour? in 3 hours?

8. A man earns $21 a week; his expenses are $14 a week. In how many weeks can he save $63?

Multiply:

9.	10.	11.	12.	13.
257	457	977	$42.57	$34.14
37	64	25	7	57

14. If sugar is 7¢ a pound, how many pounds can be bought for $3.85?

15. If 12 pounds of sugar cost 84¢, what is the price per pound?

16. There are 12 inches in a foot and 3 feet in a yard. How many inches are there in a yard?

Learn:

There are 36 inches in a yard.

17. How many inches are there in $\frac{1}{2}$ of a yard?

TABLE OF EIGHTS

Add by 8's from 8 to 96.

Learn:

$8 \times 1 = 8$	$8 \times 5 = 40$	$8 \times 9 = 72$
$8 \times 2 = 16$	$8 \times 6 = 48$	$8 \times 10 = 80$
$8 \times 3 = 24$	$8 \times 7 = 56$	$8 \times 11 = 88$
$8 \times 4 = 32$	$8 \times 8 = 64$	$8 \times 12 = 96$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1. $64 \div 8 = ?$ $\frac{1}{8}$ of $64 = ?$ $\frac{3}{8}$ of $64 = ?$
2. $72 \div 8 = ?$ $\frac{1}{8}$ of $72 = ?$ $\frac{1}{9}$ of $72 = ?$
3. Count by 8's to 96, beginning with 8.
4. Ten 8's = ? In 56 how many 8's are there?
5. Eight 8's = ? In 96 how many 8's are there?
6. $72 \div 9 = ?$ $56 \div 7 = ?$ $\frac{1}{8}$ of $96 = ?$
7. $8 \times 11 = ?$ $64 \div 8 = ?$ $\frac{1}{8}$ of $88 = ?$
8. $48 \div 8 = ?$ $8 \times 8 = ?$ $\frac{1}{10}$ of $80 = ?$

TO THE TEACHER. Continue these drills.

EXAMPLES AND PROBLEMS

ORAL

1. Give the product of each of the following numbers by 8: 9, 10, 8, 12, 11, 7, 6, 5, 4, 3, 2.

2. Give the quotient of the following numbers divided by 8: 24, 40, 56, 64, 80, 96, 88, 32, 16, 48, 72.

To the Teacher. See note, p. 100.

3. Give $\frac{1}{8}$ of the following numbers: 18, 26, 34, 43, 60, 69, 73, 71, 85, 87, 89, 92, 96, 90, 93, 65, 75, 45, 77.

4. Give the sum of $\frac{1}{8}$ and $\frac{1}{4}$ of each of the following numbers: 24, 32, 40, 48, 16, 56, 64, 72, 80, 96, 88.

5. Give the sum of $\frac{1}{6}$ and $\frac{1}{3}$ of each of the following numbers: 12, 18, 24, 36, 30, 42, 54, 48, 66, 60, 72.

6. Give the sum of $\frac{1}{2}$ and $\frac{3}{4}$ of each of the following numbers: 4, 8, 12, 20, 16, 24, 28, 32, 44, 48.

7. Give the difference between $\frac{1}{3}$ and $\frac{2}{9}$ of each of the following numbers: 18, 36, 27, 45, 63, 54.

8. If each girl in a class uses 8 hooks and eyes, how many girls will use up a card of 24 hooks and eyes?

9. If 3 girls use a card of hooks and eyes, how many cards will be used by a class of 24 girls?

Learn:

16 ounces = 1 pound

To the Teacher. By illustration or otherwise, see that pupils have definite ideas of pound and ounce.

10. How many ounces are there in half a pound? in $1\frac{1}{2}$ pounds?

11. In 1 pound and 12 ounces, how many ounces are there?

12. How many ounces are there in $2\frac{1}{2}$ pounds? in $2\frac{1}{4}$ pounds? in $2\frac{1}{8}$ pounds?

13. If an 8-ounce loaf of bread costs 5¢, how much should a pound loaf cost? How much should 4 pound loaves cost?

14. What two numbers multiplied together will give 64? 72? 96? 84? 36? 49? 25? 45? 48?

15. What two numbers multiplied together will give 24? 20? 18? 30? 40? 60? 27? 28? 33? 35? 42? 44? 50? 56? 70? Use no number larger than 12.

16. How much will $\frac{3}{4}$ of a pound of butter cost at 20¢ a pound? at 28¢ a pound?

17. How much will $\frac{5}{8}$ of a pound of butter cost at 32¢ a pound? at 40¢ a pound?

18. $\frac{1}{8}$ of a pound is how many ounces?

19. 8 ounces is what part of a pound? 2 ounces is what part of a pound? How many 8ths of a pound equal 4 ounces?

20. $\frac{2}{8}$ of a pound = what other part of a pound?

21. Compare $\frac{2}{8}$ of 24 with $\frac{1}{4}$ of 24; $\frac{2}{8}$ of 32 with $\frac{1}{4}$ of 32; $\frac{2}{8}$ of 40 with $\frac{1}{4}$ of 40; $\frac{2}{8}$ of 48 with $\frac{1}{4}$ of 48; $\frac{2}{8}$ of a number = what part of it?

22. How do you find $\frac{1}{8}$ of a number?

23. How may you find $\frac{2}{8}$ of a number without dividing it by 8?

24. In $\frac{2}{4}$ of a pound how many ounces are there? What other part of a pound equals the same number of ounces?

25. $\frac{2}{4}$ of 2 dozen are how many? $\frac{1}{2}$ of 2 dozen are how many?

26. $\frac{2}{4}$ of a number = what other part of it?

27. Show it by the use of 8 objects; 12 objects.

Learn:

$\frac{1}{2}$ of a number = $\frac{2}{4}$ of the number
$\frac{2}{4}$ of a number = $\frac{1}{2}$ of the number

28. John pays 56¢ for a book, and $\frac{1}{8}$ as much for ink. How much does the ink cost? Make two more questions on these statements.

29. How may you find $\frac{1}{4}$ of 56 without dividing it by 4?

To the Teacher. See note, p. 100.

30. Give the quotient of each of the following numbers divided by 8: 48, 72, 96, 88, 80, 56, 59, 65, 73, 70, 85, 90, 64, 68, 75, 38, 44, 57, 69, 29, 39, 49, 83.

31. Give the quotient of each of the following numbers divided by 9; by 10; by 11; by 12: 70, 67, 71, 56, 47, 57, 43, 37, 34, 39, 23, 33, 53, 68, 45, 51, 63, 28.

Written

Divide:

	a	*b*	*c*	*d*	*e*
32.	8)26	8)5408	8)3720	8)$89.68	8)$24.32
33.	8)4328	8)6520	8)5608	8)$73.68	8)$49.60
34.	8)4016	8)3368	8)4568	8)$54.64	8)$74.40

35. A farmer sold 8 colts at $65 each; 15 steers at $42 each; 25 hogs at $12 each; 32 sheep at $4 each. How much did he receive for his stock?

36. The same farmer sold 250 bushels of wheat for $275; 300 bushels of oats for $135; 175 bushels of barley for $140; 575 bushels of corn for $230. How much did he receive for his grain? How many bushels of grain did he sell?

37. John, Henry, and James each planted and cared for 2 acres of corn. John harvested 56 bushels per acre; Henry harvested 8 bushels more per acre than John; James, $\frac{1}{2}$ as much per acre as the sum of what both John and Henry harvested per acre. How many bushels did each boy harvest on his two acres?

38. How much will 2 dozen eggs cost at 28¢ a dozen? at 38¢ a dozen?

39. $\frac{1}{5}$ of a number is 8. What is the number?

40. $\frac{1}{8}$ of a number is 9. What is the number?

41. John drives 56 miles in a day; Henry drives $\frac{7}{8}$ as far. How many miles does Henry drive?

42. A piece of ribbon contains 10 yards. If 8 yards cost 24¢, how much will the whole piece cost?

43. Find the cost of the tools needed by a class of 28 pupils in paper and cardboard work, if each pupil needs 1 pair of scissors at 20¢; 1 needle, 1¢; 1 ruler, 2¢; and 1 pencil, 5¢.

44. How much less than a yard long is a piece of ribbon that measures 27 inches?

	a	*b*	*c*
45.	$156 \times 28 = ?$	$294 \times 38 = ?$	$564 \times 18 = ?$
46.	$584 \div 8 = ?$	$1976 \div 8 = ?$	$8560 \div 8 = ?$

47. Find the sum of 28×256 and 67×148.

48. $276 + 138 + 257 - 463 = ?$

49. $785 - 236 + 425 - 222 = ?$

50. $8562 \div 6 = ?$

51. $4270 \div 5 = ?$

ORAL DRILL IN ADDITION

To the Teacher. Give pupils drill by requiring them to add each number less than 10 to the numbers in columns, and in each line from left to right. Time them for rapid work.

	a	*b*	*c*	*d*	*e*	*f*
1.	6	16	26	46	56	96
2.	9	19	29	49	59	89
3.	2	12	22	42	52	62
4.	8	18	28	48	58	38
5.	5	15	25	45	55	65
6.	7	17	27	47	57	77
7.	4	14	24	44	54	84
8.	1	11	21	41	51	71
9.	3	13	23	43	53	93

Illustration: Add 9 to each number in column *a*, beginning with 6. Thus: 15, 18, 11, 17, etc. In the same way add other numbers less than 10. Add 8 to each number in the first line. Thus: 14, 24, 34, 54, 64, 104. Then add 7; 5; 4; 2; 3; 6; 9. Do similar work with numbers in the other lines.

TABLE OF NINES

Count by 9's from 9 to 108.

Learn:

$9 \times 1 = 9$	$9 \times 5 = 45$	$9 \times 9 = 81$
$9 \times 2 = 18$	$9 \times 6 = 54$	$9 \times 10 = 90$
$9 \times 3 = 27$	$9 \times 7 = 63$	$9 \times 11 = 99$
$9 \times 4 = 36$	$9 \times 8 = 72$	$9 \times 12 = 108$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1.	$9 \times 9 = ?$	$81 \div 9 = ?$	$\frac{1}{9}$ of $81 = ?$
2.	$10 \times 9 = ?$	$90 \div 9 = ?$	$\frac{1}{9}$ of $90 = ?$
3.	$11 \times 9 = ?$	$99 \div 9 = ?$	$\frac{1}{9}$ of $99 = ?$
4.	$12 \times 9 = ?$	$108 \div 9 = ?$	$\frac{1}{9}$ of $108 = ?$

TO THE TEACHER. Continue the drill.

5. Subtract by 9's from 108.

6. Twelve 9's = ? In 81 how many 9's?

7. Nine 9's = ? In 108 how many 9's?

8. Eleven 9's = ? In 99 how many 9's?

9. Ten 9's = ? In 63 how many 9's?

10.	$6 \times 9 = ?$	$9 \times 5 = ?$	$\frac{1}{9}$ of $81 = ?$
11.	$63 \div 7 = ?$	$54 \div 9 = ?$	$\frac{1}{11}$ of $99 = ?$

TO THE TEACHER. Continue the drill.

12. What is the difference between 6×9 and 9×9?

13. $9 \times 10 = ?$ $9 \times 11 = ?$ $9 \times 12 = ?$

14. Find one ninth of 36, 27, 63, 45, 81, 108.

15. Find two ninths of 18; three ninths of 18.

16. If each child uses 9 inches of ribbon for a calendar, how many inches are used by a class of 40 children?

17. One third of 18 is how many ninths of it?

18. One ninth of $27 = ?$ Three ninths of $27 = ?$ One third of $27 = ?$

19. One third of 27 equals how many ninths of it?

20. How may you find three ninths of a number without dividing it by 3? without dividing it by 9?

Three ninths of a number equal one third of it. To find three ninths of a number, first divide the number by 9 to find one ninth of it; then multiply the quotient by 3 to find three ninths of it. Or, divide the number by 3 to find one third of it, which is three ninths of it.

21. Two eighths of a number equal how many fourths of it? One half of a number equals how many fourths of it? how many eighths of it?

Learn:

One half of a number equals two fourths of the number.
One half of a number equals four eighths of the number.
One half of a number equals three sixths of the number.
One third of a number equals three ninths of the number.
One fourth of a number equals three twelfths of the number.

22. Find $\frac{1}{2}$ of 18; $\frac{1}{4}$ of 36; $\frac{1}{3}$ of 27; $\frac{1}{6}$ of 54.

23. Find $\frac{1}{8}$ of 72; $\frac{1}{9}$ of 18; $\frac{1}{5}$ of 45; $\frac{1}{12}$ of 108; $\frac{1}{10}$ of 90.

24. Find $\frac{5}{9}$ of 36; of 27; of 18; of 45; of 54; of 72.

25. If you have $\frac{2}{9}$ of a number given, how can you find one ninth of that number? One ninth is one half of two ninths.

26. What is $\frac{1}{9}$ of 63? $\frac{2}{9}$ of 63? $\frac{1}{2}$ of 14?

27. The number 7 is $\frac{1}{9}$ of what number?

28. What two numbers multiplied together give 18? 27? 36? 54? 63? 72? 81? 48? 24? 30?

REVIEW

Divide:

	a	*b*	*c*	*d*	*e*
1.	9)108	9)270	9)$1.89	9)$9.18	9)$72.90
2.	9)4509	9)5418	9)7236	9)$81.18	9)$18.54

3. The quotient is 5; the divisor is 9. What is the dividend?

4. The dividend is 81; the divisor is 9. What is the quotient?

5. If the dividend is divided by the quotient, what will the result equal? Give an example.

Learn:

A number that will contain another number exactly is called a multiple of that number.

18 is a multiple of 9. 27 is a multiple of 9. Give other illustrations.

6. Give in order, as far as 108, the other multiples of 8.

7. What is the largest multiple of 9 you have learned? the smallest? Give other multiples between these two.

8. Give the multiples of 8 in order, beginning with 8.

9. 16 is a multiple of what other numbers besides 8?

10. 12 is a multiple of what numbers?

11. 20 is a multiple of what numbers?

12. 24 is a multiple of what numbers?

PROBLEMS

Written

1. A carriage dealer sells 9 carriages at $87 apiece, and 7 wagons at $75 each. How much does he receive for the carriages? for the wagons?

Make another question. Answer it.

2. A real estate dealer sells 5 lots for $1045 and 4 lots for $1304. How much does he receive for the 9 lots?

3. What is the average price he receives for each lot? Make a similar problem, using small numbers.

The **average** price is equal to the total price divided by the number of articles. $1045 + $1304 = $2349; 5 + 4 = 9; $2349 ÷ 9 = $261, the average price.

4. If an ocean steamer sails 459 miles in 9 days, how far, on the average, does it sail in 1 day?

5. If an errand boy earns $18 a month and spends $9 a month, how long will it take him to save $99?

ANALYSIS: If he earns $18 a month and spends $9 a month, he saves $9 a month. It will take him as many months to save $99 as 9 is contained times in 99, or —— months.

6. A bicycle wheel is 9 feet around. How far has the bicycle gone when the wheel has turned around 116 times?

7. How many times will a wheel that is 9 feet around turn in going 621 feet?

8. A boy buys a bushel of berries for one dollar, and sells them at 29 cents a peck. How much does he gain? Analyze by question and answer.

9. A merchant spends $19 for cotton goods and twice as much for woolen goods. Make two problems from these conditions. Solve each.

10. A grocer buys 49 barrels of apples at $2.55 a barrel and sells them at $3 a barrel. What is his gain? Work the shortest way.

11. If a dealer pays $348 a dozen for suits of ready-made clothing, how much does he pay for 9 suits? What is the first question to be answered?

TO THE TEACHER. See note, p. 100.

12. Divide each of the following numbers by 9, giving the quotients and remainder in each case: 20, 24, 28, 30, 38, 40, 46, 64, 48, 73, 57, 65, 82, 88, 93, 100.

TABLE OF TENS

Count by 10's from 10 to 100.

Learn:

$10 \times 1 = 10$	$10 \times 5 = 50$	$10 \times 9 = 90$
$10 \times 2 = 20$	$10 \times 6 = 60$	$10 \times 10 = 100$
$10 \times 3 = 30$	$10 \times 7 = 70$	$10 \times 11 = 110$
$10 \times 4 = 40$	$10 \times 8 = 80$	$10 \times 12 = 120$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1. $100 \div 10 = ?$ $\frac{1}{10}$ of $100 = ?$ $\frac{3}{10}$ of $100 = ?$
2. $110 \div 10 = ?$ $\frac{1}{10}$ of $110 = ?$ $\frac{1}{11}$ of $110 = ?$
3. $120 \div 10 = ?$ $\frac{1}{10}$ of $120 = ?$ $\frac{1}{12}$ of $120 = ?$
4. Subtract by 10's from 120.
5. How many are 10×10? 12×10? 11×10? 10×12? 9×10? 6×10? 8×10? 7×10?
6. How many 10's are there in 80? in 90? in 70?
7. $\frac{3}{10}$ of $50 = ?$ $\frac{5}{10}$ of $70 = ?$ $\frac{8}{10}$ of $80 = ?$
8. $\frac{6}{10}$ of $40 = ?$ $\frac{7}{10}$ of $90 = ?$ $\frac{9}{10}$ of $30 = ?$
9. $\frac{1}{2}$ of $20 = ?$ $\frac{1}{2}$ of 20 = what other fractional part of 20?

$\frac{1}{2}$ of any number equals $\frac{5}{10}$ of that number.

10. Find $\frac{1}{3}$ of 30; $\frac{1}{2}$ of 30; $\frac{1}{4}$ of 40; $\frac{1}{2}$ of 40; $\frac{1}{6}$ of 60; $\frac{1}{5}$ of 50; $\frac{1}{7}$ of 70; $\frac{1}{9}$ of 90; $\frac{1}{8}$ of 80; $\frac{1}{11}$ of 110.
11. What is $\frac{1}{10}$ of 20? $\frac{2}{10}$ of 20? $\frac{1}{5}$ of 20?
12. $\frac{1}{5}$ of 20 = how many 10ths of it? $\frac{1}{5}$ of 30 = how many 10ths of it? 6 = how many 10ths of 30?

13. $\frac{1}{5}$ of 40 = what? How many 10ths of 40 = 8?

14. $\frac{2}{10}$ of a number = what part of it?

15. How do you find $\frac{1}{5}$ or $\frac{2}{10}$ of a number?

Complete the following:

16.

$1 \times 10 = ?$	$5 \times 10 = ?$	$9 \times 10 = ?$
$2 \times 10 = ?$	$6 \times 10 = ?$	$10 \times 10 = ?$
$3 \times 10 = ?$	$7 \times 10 = ?$	$11 \times 10 = ?$
$4 \times 10 = ?$	$8 \times 10 = ?$	$12 \times 10 = ?$

17. Compare the products with the numbers multiplied, and tell what has been done in each case.

Learn:

To multiply a number by 10, annex a 0 to the right of the number.

18. If you divide each of the products in Ex. 16 by 10, what will your result be?

Learn:

To divide a number ending in 0 by 10, cut off the unit 0.

19. Divide rapidly by 10: 50, 60, 100, 340, 640, 590.

20. Multiply rapidly by 10: 15, 25, 49, 63, 72, 81, 48.

21. Divide: $10\overline{)275}$ $\quad 27\frac{5}{10}$

Cut off the units' figure 5, and write it over the divisor 10 at the right of the remaining figures of the quotient.

22. Divide by 10: 348, 567, 285, 342, 168, 278, 564.

PROBLEMS

ORAL

1. There are 2 cups of rolled oats in 1 pound. How many cups are there in a 10-pound sack?

2. If 2 cups of rolled oats will serve breakfast for 8 people, for how many breakfasts will 10 cups serve them?

3. If I buy 10 dozen eggs at 2¢ apiece, how much do I pay for them?

4. In $\frac{5}{10}$ of an hour how many minutes are there?

5. In $\frac{1}{2}$ of an hour how many minutes are there?

6. $\frac{1}{2}$ hour = how many 10ths of an hour?

7. $\frac{1}{2}$ hour = how many 12ths of an hour?

8. $\frac{1}{2}$ hour = how many 6ths of an hour?

9. $\frac{1}{2}$ hour = how many 4ths of an hour?

10. If 10 tape measures cost $1, how much will 5 tape measures cost? 4 tape measures? 8 tape measures?

11. A man travels 120 miles in 10 hours. How far can he travel in 7 hours?

12. If he travels 60 miles in 5 hours, how long will it take him to travel 84 miles?

13. 30 is $\frac{1}{10}$ of what number? 7 is $\frac{1}{10}$ of what number?

14. 7 dimes are how much more than 50 cents? 7 dimes are how much less than $\frac{3}{4}$ of a dollar? how much less than a dollar? how much more than a quarter of a dollar?

TABLE OF ELEVENS

Learn:

$11 \times 1 = 11$	$11 \times 5 = 55$	$11 \times 9 = 99$
$11 \times 2 = 22$	$11 \times 6 = 66$	$11 \times 10 = 110$
$11 \times 3 = 33$	$11 \times 7 = 77$	$11 \times 11 = 121$
$11 \times 4 = 44$	$11 \times 8 = 88$	$11 \times 12 = 132$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1. $121 \div 11 = ?$ $\frac{1}{11}$ of $121 = ?$ $\frac{5}{11}$ of $121 = ?$
2. $132 \div 11 = ?$ $\frac{1}{11}$ of $132 = ?$ $\frac{1}{12}$ of $132 = ?$
3. Twelve 11's = ? 132 = how many 11's?
4. Eleven 11's = ? 121 = how many 11's?
5. $132 \div 12 = ?$ $99 \div 9 = ?$ $\frac{1}{11}$ of $121 = ?$
6. $110 \div 10 = ?$ $88 \div 11 = ?$ $\frac{1}{11}$ of $88 = ?$

EXAMPLES AND PROBLEMS

WRITTEN AND ORAL

Multiply by 11 as though it were a single figure:

	a	*b*	*c*	*d*	*e*	*f*
7.	256	384	472	9286	$47.52	$34.02
	11	11	11	11	11	11

Divide and test:

8. $11)2200$ $11)3311$ $11)4444$ $11)\$56.10$

9. Divide the following numbers by 11: 792, 869.

10. Multiply the following numbers by 11, using 11 as though it were a single figure: 274, 356, 599, 684.

11. Divide the following numbers by 11: 864, 372.

12. Find $\frac{3}{11}$ of 880; of 363; of 990.

13. If 11 horses cost \$1386 and 11 cows cost \$440, what is the cost of one horse? of one cow? How much more do 2 horses cost than 3 cows?

14. The difference between $\frac{1}{5}$ of a number and $\frac{4}{5}$ of the number is how many 5ths of that number?

15. The difference between $\frac{8}{11}$ of a number and $\frac{5}{11}$ of the number is how many 11ths of that number?

16. The sum of $\frac{3}{11}$ of a number and $\frac{4}{11}$ of the number is how many 11ths of that number?

17. Find the sum of $\frac{3}{11}$ of 88 and $\frac{4}{11}$ of 88 in two ways.

18. $\frac{5}{11}$ of 132 are how many more than $\frac{3}{11}$ of the same number? Work in two ways.

19. 20 is $\frac{1}{11}$ of what number?

20. A farmer has 2 fields; one containing 20 acres is $\frac{1}{11}$ as large as the other. What is the size of the other field?

ANALYSIS: If a field of 20 acres is $\frac{1}{11}$ the size of another field, the size of the other field is 11×20 acres, or 220 acres.

21. A farmer has 660 bushels of oats in a bin and $\frac{1}{11}$ as many bushels of wheat in another bin. How many bushels of wheat has he in both bins?

TABLE OF TWELVES

Learn:

$12 \times 1 = 12$	$12 \times 5 = 60$	$12 \times 9 = 108$
$12 \times 2 = 24$	$12 \times 6 = 72$	$12 \times 10 = 120$
$12 \times 3 = 36$	$12 \times 7 = 84$	$12 \times 11 = 132$
$12 \times 4 = 48$	$12 \times 8 = 96$	$12 \times 12 = 144$

TABLE FOR DRILL IN GIVING PRODUCTS AND QUOTIENTS RAPIDLY

1.	$12 \times 12 = ?$	$144 \div 12 = ?$	$\frac{1}{12}$ of $144 = ?$
2.	Eight 12's $= ?$	$96 \div 12 = ?$	$\frac{1}{12}$ of $84 = ?$
3.	Six 12's $= ?$	$132 \div 12 = ?$	$\frac{1}{9}$ of $108 = ?$
4.	Eleven 12's $= ?$	$72 \div 6 = ?$	$\frac{1}{12}$ of $60 = ?$
5.	Four 12's $= ?$	$36 \div 12 = ?$	$\frac{1}{2}$ of $24 = ?$
6.	Subtract by 12's from 144.		
7.	Subtract by 12's from 137.		
8.	Five 12's $= ?$	$24 \div 12 = ?$	$\frac{1}{3}$ of $36 = ?$
9.	Seven 12's $= ?$	$108 \div 12 = ?$	$\frac{1}{10}$ of $120 = ?$
10.	Two 12's $= ?$	$84 \div 12 = ?$	$\frac{1}{8}$ of $96 = ?$
11.	Nine 12's $= ?$	$60 \div 12 = ?$	$\frac{1}{12}$ of $72 = ?$
12.	Three 12's $= ?$	$48 \div 12 = ?$	$\frac{1}{12}$ of $96 = ?$
13.	Ten 12's $= ?$	$120 \div 12 = ?$	$\frac{1}{12}$ of $132 = ?$
14.	What is $\frac{1}{6}$ of 120?	$\frac{2}{12}$ of 120?	$\frac{1}{6} = \frac{?}{12}$
15.	What is $\frac{1}{4}$ of 60?	$\frac{3}{12}$ of 60?	$\frac{1}{4} = \frac{?}{12}$

PROBLEMS AND EXAMPLES

ORAL

1. If a recipe makes 12 griddle cakes, how many will $\frac{1}{4}$ the recipe make?

2. How many pencils are there in 6 dozen pencils? in 8 dozen pencils?

3. How many inches are there in 3 feet? in $\frac{1}{2}$ a yard? in $\frac{1}{3}$ of a yard?

4. January, February, and March are what part of the year?

5. If I wish to sew 72 buttons on cards, each containing a dozen, how many cards must I use?

6. Tell at sight: 6×12; 8×12; 12×12; 9×12.

7. $72 \div 12$; $72 \div 6$; $84 \div 12$; $96 \div 12$; $108 \div 12$.

8. Find: $\frac{1}{12}$ of 144; $\frac{1}{6}$ of 72; $\frac{1}{12}$ of 72; $\frac{1}{12}$ of 60; $\frac{1}{8}$ of 96; $\frac{1}{2}$ of 48; $\frac{1}{3}$ of 36; $\frac{1}{12}$ of 48; $\frac{1}{12}$ of 108.

9. How many months are there in 3 years? in 9 years? in 12 years?

10. If you have 96 nails in your nail box, how many dozen nails have you?

11. How many persons will be served by a recipe for 12 griddle cakes, allowing 3 griddle cakes to each person?

12. How many feet are equal to 108 inches?

13. When the hour hand is between XI and XII and the minute hand points to VI, what time is it?

14. What time is it when the hour hand points to VI and the minute hand to XII?

15. What is a multiple of a number? Give the multiples of 12 as learned in the multiplication table. Thus, $1 \times 12 = 12$, $2 \times 12 = 24$, etc.

16. Find $\frac{1}{12}$ of the following numbers: 24, 60, 48, 72, 144, 84, 96, 132, 72, 36.

17. What are $\frac{2}{12}$ of 24? 4 is how many sixths of 24? $\frac{1}{6}$ of 24 = how many 12ths of 24?

18. $\frac{1}{6}$ of 36 = ? $\frac{1}{12}$ of 36 = ?

19. $\frac{1}{6}$ of a number = how many 12ths of it?

20. How do you find $\frac{1}{12}$ of a number?

21. How may you find $\frac{1}{6}$ of a number without dividing the number by 6?

22. How much is $\frac{1}{6}$ of 144? How much is $\frac{1}{6}$ of 132? $\frac{1}{6}$ of 114?

23. What are $\frac{3}{12}$ of 24? This number = how many fourths of 24? Prove that $\frac{1}{4}$ of 48 = $\frac{3}{12}$ of 48.

24. How much is $\frac{3}{12}$ of 36? How much is $\frac{1}{4}$ of 36?

25. Take 2 groups of 12 objects each and show that $\frac{3}{12}$ of one group = $\frac{1}{4}$ of the other group.

26. What are $\frac{6}{12}$ of 24? What is $\frac{1}{2}$ of 24? $\frac{6}{12}$ of 24 = how many halves of 24? How can you change $\frac{1}{2}$ to $\frac{6}{12}$?

27. Show that $\frac{6}{12}$ of any number = $\frac{1}{2}$ of it.

28. $\frac{8}{12}$ of a number are how many times $\frac{4}{12}$ of it? $\frac{4}{12}$ of a number are how many thirds of it? $\frac{8}{12}$ of a number are how many thirds of it?

WRITTEN

29. Multiply the following by 12, using 12 as though it were a single digit: 245, 872, 102, 567, 729.

30. Divide by 12 in written form: 48, 49, 50, 54, 58, 72, 64, 129, 134, 144, 136, 1308, 3612, 4824.

31. In 276 months how many years are there?

32. A box contains 288 oranges. If they are sold for 25¢ a dozen, how much will be received for them?

33. A man receives a salary of $1000 a year. He pays $18 a month for a house, $35 a month for meat and groceries, $200 a year for clothing, $100 for other expenses. What are his entire expenses? How much has he left at the end of the year?

34. A man sells 12 horses for $960, and 9 cows for $315. How much more does he receive for a horse than for a cow?

35. I buy at a grocery 12 pounds of sugar at 6¢ a pound, 4 dozen eggs at 35¢ a dozen, and 6 oranges at 40¢ a dozen. What is the amount of my bill?

36. If 12 horses cost $1680, what is the average price of each horse?

37. How many dozen eggs, worth 12¢ a dozen, will pay for 20 pounds of sugar worth 7¢ a pound, and a gallon of sirup worth 76¢?

38. How many inches are there in a foot? in 3 feet? in 12 feet?

REVIEW

DRILL 1

1.	6	3
	4	8
	9	10
	12	5
	2	11
	7	1

To the Teacher. Drill pupils in multiplying each of the numbers in the two columns at the left by numbers from 2 to 12 inclusive. Write the numbers on the board and write the multiplier at the left of each column. Conduct the drill by pointing to different numbers in each column, requiring pupils to give instantly the product of the number pointed out by the number at the left.

Give products rapidly:

2.	6	9	10	11	12	7	12	9	11	8	12
	8	7	5	4	5	3	7	12	8	9	6
3.	7	10	9	8	9	10	9	11	9	7	6
	11	8	6	5	5	9	4	9	3	8	5

Name:

4. The multiples of 3 to 102.
5. The multiples of 4 to 100.
6. The multiples of 5 to 100.
7. The multiples of 6 to 102.
8. The multiples of 7 to 105.
9. The multiples of 8 to 104.
10. The multiples of 9 to 108.
11. The multiples of 10 to 120.
12. The multiples of 11 to 132.
13. The multiples of 12 to 144.

To the Teacher. In conducting these exercises, put any set of multiples on the board in irregular order, placing the divisor at the left, and have pupils give the quotients from the top down and from the bottom up.

Teacher or some pupil point to different multiples and call upon individuals to give the results. Drill for speed and accuracy.

Give drill in dividing numbers to 100 by numbers to 12 where the division is not exact.

DRILL 2

Multiply:

	a	*b*	*c*	*d*	*e*
1.	$24.65	$54.89	$64.78	$53.02	$78.03
	7	8	9	5	6
2.	453	562	783	941	823
	25	64	56	89	78
3.	569	876	543	909	888
	73	59	46	35	67
4.	875	912	823	403	809
	83	76	89	95	49
5.	452	432	491	765	421
	92	87	62	44	59
6.	349	589	705	412	650
	86	74	56	78	98
7.	800	649	615	654	458
	41	82	87	53	76
8.	784	720	839	329	975
	95	93	49	36	57
9.	561	518	476	876	642
	69	48	57	64	58
10.	815	604	520	409	396
	79	84	77	68	58

DRILL 3

1. Give $\frac{1}{4}$ of each of the following numbers:
12, 16, 20, 28, 32, 64, 48, 24, 40, 44, 36.

2. Give $\frac{1}{5}$ of each of the following numbers:
10, 15, 25, 45, 30, 35, 20, 40, 60, 50, 55.

3. Give $\frac{1}{6}$ of each of the following numbers:
12, 24, 48, 18, 60, 36, 54, 30, 42, 66, 72.

4. Give $\frac{2}{6}$ and $\frac{5}{6}$ of each of the numbers in Ex. 3.

$\frac{1}{6}$ of $12 = 2$; $\frac{2}{6}$ of $12 = 2 \times 2 = 4$; $\frac{5}{6}$ of $12 = 5 \times 2 = 10$, etc.

5. Give $\frac{1}{8}$, $\frac{3}{8}$, and $\frac{5}{8}$ of each of the following numbers:
16, 64, 24, 96, 32, 88, 72, 48, 80, 56, 8, 40.

6. Give $\frac{1}{7}$, $\frac{2}{7}$, and $\frac{5}{7}$ of each of the following numbers:
28, 14, 84, 70, 35, 77, 42, 21, 49, 63, 56, 7.

7. $\frac{1}{7}$ of $15 = 2\frac{1}{7}$; $\frac{1}{7}$ of $24 = 3\frac{3}{7}$; $\frac{1}{7}$ of $33 = ?$

8. Give $\frac{1}{7}$ of each of the following numbers:
16, 18, 22, 25, 29, 36, 38, 54, 65, 46, 73, 85, 34, 45.

9. Give products without writing figures. Thus:
$2 \times 50 = 100$. $2 \times 70 = 140$. $5 \times 80 = 400$. $3 \times 13 = 39$.

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*
10.	30	40	50	60	80	90	100	1000
	3	3	7	8	9	5	4	5
11.	22	31	36	33	52	48	400	2000
	4	5	2	4	6	2	7	4

12. Give $\frac{1}{2}$, $\frac{1}{3}$, $\frac{1}{4}$, $\frac{1}{5}$, $\frac{1}{6}$, $\frac{1}{7}$, $\frac{1}{8}$, $\frac{1}{9}$, $\frac{1}{10}$, $\frac{1}{11}$, $\frac{1}{12}$ of:
16, 18, 20, 24, 25, 28, 30, 32, 35, 36, 40, 60, 48, 36, 77, 42, 44, 50, 56, 66, 64, 65, 99, 72, 80, 81, 84, 96, 108.

PROBLEMS

ORAL

1. A desk is 48 inches long and $\frac{1}{3}$ as wide. How wide is it? Its width is how many inches more than 1 foot?

2. A sewing machine costs \$35 and a gas stove $\frac{3}{5}$ as much. How much does the gas stove cost? Ask and answer two more questions on this problem.

3. If $\frac{1}{4}$ of a pound of tea costs 15¢, what is the value of one pound?

4. 5 is $\frac{1}{3}$ of what number? What is $\frac{2}{3}$ of the number?

5. 10 is $\frac{1}{3}$ of what number? $\frac{1}{4}$ of what number?

6. Draw a line 1 foot long. Draw a line $\frac{1}{6}$ of a foot long. How many inches long is the second line? How do you find $\frac{1}{6}$ of 12 inches? $\frac{5}{6}$ of 12 inches?

7. How many pecks are there in 1 bushel? How many quarts are there in 1 peck? How many quarts are there in 1 bushel?

8. If you know the number of quarts in 1 peck and the number of pecks in 1 bushel, how can you find the number of quarts in 1 bushel? in 5 bushels?

9. How many quarts are there in 6 bushels? in 10 bushels? in 8 bushels?

10. How can you find the number of quarts in $\frac{1}{2}$ bushel? How can you find the number of quarts in $\frac{1}{4}$ bushel? in $\frac{3}{4}$ bushel?

11. $\frac{7}{8}$ of a bushel is how many quarts more than $\frac{3}{4}$ of a bushel?

12. In a cooking class of 24 pupils, $\frac{3}{4}$ of the pupils have made good loaves of bread. How many in the class have not made good bread?

13. An arithmetic costs 30¢, a speller costs $\frac{1}{2}$ as much, and a copy book, $\frac{1}{3}$ as much as the speller. What part of a dollar do they all cost?

14. $\frac{2}{3}$ of 18 is how many more than $\frac{1}{6}$ of 18? than $\frac{1}{2}$ of 18?

15. The width of a room is $\frac{3}{4}$ of its length. It is 24 feet, or 8 yards, long. How wide is it in feet? in yards?

16. If the room is carpeted and the strips run the long way of the room, how many yards long is each strip? If the strips are 1 yard wide, how many such strips will it take to cover the floor?

17. Draw a figure on a scale of 1 inch to 1 yard to represent a floor 8 yards long and 6 yards wide. Draw lines to show the number of strips of carpet needed.

18. How many yards of carpet are there in each strip? Draw lines across the space representing 1 strip, to show the number of yards of carpet in the strip.

19. How many yards of carpet are there in the whole number of strips?

To the Teacher. Have pupils draw a figure representing the room with the strips of carpet running across it, and find the number of yards of carpet it takes to cover the floor.

20. A man has 27 acres of corn in one field and $\frac{2}{3}$ as many acres of oats in another field. How many more acres of corn has he than of oats?

21. There are 16 ounces in 1 pound. 8 ounces are what part of a pound? 4 ounces are what part of a pound? 2 ounces?

22. John has 30 cents. Alfred has $\frac{2}{3}$ as many as John. Alfred loses 10 cents. How many cents has he left? The number he has left is what part of the number John has?

23. How do you find $\frac{1}{8}$ of any number? $\frac{5}{8}$ of it?

24. Find $\frac{5}{8}$ of 32; $\frac{3}{8}$ of 40; $\frac{7}{8}$ of 56; $\frac{4}{8}$ of 72.

WRITTEN

25. Find $\frac{3}{4}$ of 172; $\frac{3}{5}$ of 225; $\frac{4}{7}$ of 224; $\frac{5}{9}$ of 297.

26. Three newsboys get 72 newspapers. Each has the same number. What part of the whole number has each? How many has each?

27. If the boys pay 3¢ for each paper, and sell each for 5 ¢, how much money has each made when he has sold all his papers?

28. If $\frac{2}{3}$ of a dozen buttons cost 20¢, how much will $\frac{1}{3}$ of the dozen cost? the whole dozen?

29. If a pie is cut into 6 equal pieces, what part of the pie are 2 pieces? 4 pieces?

30. Find $\frac{2}{9}$ of 153; $\frac{3}{7}$ of 273; $\frac{2}{3}$ of 225.

31. How do you find $\frac{2}{9}$ of any number? $\frac{3}{7}$? $\frac{2}{3}$?

DRILL

1. Multiply each of the following numbers by 4, and add 6 to the product:

7, 2, 12, 9, 4, 6, 3, 8, 10, 5, 11.

2. Multiply each number above first by 2; then by 5; by 3; by 6; by 7; by 8; by 9; by 11; by 10; and by 12.

3. Add to each product in example 1 first 19; then 23; then 34; then 45; then 56; then 67; then 78.

4. Subtract from each product in example 1, 2 times the number multiplied.

5. Divide each of the following numbers by 5:

24, 36, 47, 58, 62, 18, 29, 23, 38, 53, 17, 52, 39, 43, 33.

Thus, 5 is contained in 24, $4\frac{4}{5}$ times.

To THE TEACHER. The work may also be given as a written exercise, the pupils being required to write the answers in a given time.

6. Divide first by 2; then by 4; then by 3; then by 5; then by 7; then by 6; then by 9:

17, 19, 36, 28, 47, 56, 63, 39, 58, 64, 35, 27, 34, 42.

7. One equals $\frac{4}{4}$. How many fourths does each of the following numbers equal?

8, 7, 3, 12, 9, 11, 6, 10, 4, 3, 2, 1.

8. One equals $\frac{6}{6}$. How many sixths does each of the following numbers equal?

2, 4, 6, 8, 10, 3, 5, 7, 9, 12.

9. One equals $\frac{7}{7}$. How many sevenths does each of the following numbers equal?

3, 6, 9, 12, 2, 5, 8, 11, 7, 10.

REVIEW OF UNITED STATES MONEY

ORAL AND WRITTEN

1. Read the following numbers:

$5.50, $3.87, $23.10, $15.05, $.25, $.15, $4.00, $.10, $.14, $.75, $.05, $.08, $2.05, $3.08, $4.09, $.01, $15.01, $.02, $7.02, $107.03.

TO THE TEACHER. After pupils have read the foregoing numbers, read them, and have pupils write as you read. Be careful to see that the decimal point and the dollar sign are used in each case.

Write and add the following:

2. Fifteen dollars and twenty-five cents, seventeen dollars and eighteen cents, nineteen dollars and nine cents, five dollars and thirty-five cents, eight cents, two dollars and five cents, seven cents, four dollars and twenty-six cents.

3. Find the difference between the first and second of the above numbers; the second and the third; the seventh and the eighth.

4. Find the cost of cream puffs requiring $.09 worth of butter, $.09 worth of eggs, $.01 worth of flour, and $.20 worth of cream.

5. Find the cost of jellied veal for which you need $.48 worth of veal, $.03 worth of celery, $.01 worth of onion and carrot, and $.05 worth of eggs.

Multiply:

6.	7.	8.	9.
$5.25	$4.15	$3.02	$6.01
2	6	4	8

10.	11.	12.	13.
\$.25	\$.15	\$.08	\$.12
5	6	18	11

14. If eggs cost 28¢ a dozen, what is the cost of 15 dozen? of 25 dozen?

15. If sugar costs 6¢ per pound, how much will 25 pounds cost? 125 pounds?

16. A boy sells 125 papers at 5¢ each. How much does he receive for them?

17. If a man receives \$ 3.20 for a day's work of 8 hours, how much does he receive per hour?

18. Mary buys 6 yards of silk for \$ 19.20. How much does it cost per yard?

19. Find the total cost of the following: 4 pounds of tea at \$.75 per pound; 6 dozen eggs at \$.25 per dozen; 4 pounds of walnuts at \$.18 per pound; 5 pounds of honey at \$.20 per pound.

20. A man paid \$ 1.50 per day for his room at a hotel. How much did his room cost him per week?

21. If he paid \$.50 for his breakfast, \$.75 for his dinner, and \$.50 for his supper each day, how much did his meals cost him for one day? for one week?

22. A grocer buys 8 boxes of Washington apples for \$ 20. How much does he pay per box?

23. If he sells them for \$ 22.40, what is his gain on each box?

24. At \$.50 each for scissors, \$.25 each for thimbles, and \$.05 each for needles, find the cost of fitting up 15 workbaskets with these articles.

25. A man pays $2.00 for a bushel of seed corn. He uses 1 peck of it to plant one field, $\frac{1}{2}$ bushel to plant a second field, and the remainder to plant a third field. What is the cost of the corn for each field?

26. In the first field he raises 55 bushels per acre; in the second field, 60 bushels per acre; in the third field, 65 bushels per acre. If he sells his corn for 45¢ per bushel, how much does he receive per acre from each of the three fields?

27. The owner of a brickyard pays $262.50 to his men on Saturday night of each week. What amount of wages does he pay per day?

28. A girl has $2.75; she gives $\frac{1}{5}$ of it to her sister, and spends $\frac{2}{5}$ of it for sewing materials. How much has she left?

29. A man earns $45 per month. He spends $\frac{1}{10}$ of his earnings for clothes; $\frac{2}{5}$ of his earnings for board; and $\frac{1}{9}$ of his earnings for other expenses. How much does he save?

30. A man buys a farm of 120 acres for $24 an acre. He sells it so as to gain $\frac{1}{8}$ of what it cost him. How much does he receive for it?

31. 6 horses; 2 horses; $750. Make and solve a problem using these three numbers.

32. If 8 days' work cost $16, how much does 1 day's work cost?

33. If 2 tons of coal cost $12, find, in the shortest way, how much 6 tons cost.

PROBLEMS WITHOUT NUMBERS

To the Teacher. To secure correct thinking and accurate, ready expression, it is an excellent plan to give pupils general problems without numbers. Have them tell how they are solved, and then require them to make problems using numbers, to illustrate these general problems.

General Problem. If the number of tons of coal and the price per ton are known, how can you find the entire cost of the coal?

Answer. Multiply the price of 1 ton by the number of tons.

Special Problem illustrating the General Problem. If coal is worth $7 per ton, what is the cost of 8 tons?

Illustrate each problem:

1. If the number of feet in a yard are known, how can you find the number of feet in any number of yards?

2. If the sum of two numbers and one of the numbers are known, how can you find the other number?

3. If one number and the difference between it and another number are known, how can you find the other?

4. If the cost of a number of pounds of tea and the price of 1 pound are known, how can you find the number of pounds?

5. If the cost of a quantity of coffee and the number of pounds are known, how can you find the price per pound?

6. If the multiplier and the product are known, how can you find the multiplicand?

7. If the multiplicand and the product are known, how can you find the multiplier?

8. If the subtrahend and the minuend are known, how can you find the difference?

NOTATION AND NUMERATION TO MILLIONS

STUDY RECITATION

10 units	= 1 ten,	or	10
10 tens	= 1 hundred,	or	100
10 hundreds	= 1 thousand,	or	1000
10 thousands	= 1 ten thousand,	or	10,000
10 ten thousands	= 1 hundred thousand,	or	100,000
10 hundred thousands	= 1 million,	or	1,000,000

Numbers in the first place are called **units**; in the second place, **tens**; in the third, **hundreds**; in the fourth, **thousands**; in the fifth, **ten-thousands**; in the sixth, **hundred-thousands**; in the seventh, **millions.**

Numbers of more than four figures are pointed off as above; the first three figures make the first **period** (*units*), the next three, the second **period** (*thousands*), and so on.

To read numbers, begin at the left, read the number in that period as though it stood alone, and give it the name of the first place in the period, which is the name of the period. Read the next period at the right in the same way, and so on.

Thousands	Units	
1	111	The number is read, one *thousand* one hundred eleven. In reading numbers the name of the first period at the right is usually omitted.
10	789	The number is read, ten *thousand* seven hundred eighty-nine.

Millions	Thousands	Units	
2	846	257	The number is read, two *million* eight hundred forty-six thousand, two hundred fifty-seven.

Read the following numbers, giving the number of *millions* in the third period, the number of *thousands* in the second period, and the number of *units* in the first period, but omit the name *units*.

Do not use *and* in reading these numbers.

Millions Hundred-Thousands Ten-Thousands Thousands Hundreds Tens Units	Millions Hundred-Thousands Ten-Thousands Thousands Hundreds Tens Units	Millions Hundred-Thousands Ten-Thousands Thousands Hundreds Tens Units
1000	1111	1201
2000	2222	2304
3000	3333	4056
4000	4321	5078
5000	5432	6720
6000	6123	7040
7000	7234	8007
8000	8345	9006
9000	9567	10,007
10,000	10,789	10,017
25,000	46,344	47,015
57,000	57,456	57,025
125,000	125;140	125,010
268,000	268,400	268,002
2,000,000	2,346,257	2,563,004
Mil- Thou- Units lions sands	Mil- Thou- Units lions sands	Mil- Thou- Units lions sands

Write the following numbers:

To the Teacher. Have each number of more than four figures separated into periods by commas.

1. Nine hundred eight.
2. Seven hundred fifty-six.
3. Nine thousand, two hundred forty-three.
4. Eight thousand, five hundred sixty-four.
5. Twenty-seven thousand, three hundred eight.
6. Fifty-four thousand, five hundred six.
7. One hundred twenty-three thousand, two hundred seven.
8. Three hundred four thousand, two hundred.
9. Three hundred twenty-five thousand, six.
10. Seventy-eight thousand, seven.
11. One hundred ten thousand, three hundred eight.
12. Five hundred ten thousand, nine.

Write the following numbers in columns, placing the units of the same name in the same column, and find their sum:

13. Four thousand, five hundred twenty-eight.
14. Five hundred ninety-six.
15. Three hundred seven.
16. Five thousand, eight hundred twenty-four.
17. Six thousand, three hundred nine.
18. Four thousand, three hundred seventy-five.
19. Three million, sixty thousand, seven.

MULTIPLIERS OF THREE FIGURES

1. Multiply:

267
423
801
534
1068
112,941

Multiply by 23, as in example 1, p. 116. Then multiply by 4 hundreds, placing the first figure in the same column as the multiplier, 4. 4 times 7 = 28. Write 8 in hundreds' column, under 3. Add 2 to 4 times 6, making 26. Write 6 at the left of 8. Add 2 to 4 times 2, making 10. Write 10 at the left of 6. Add the three partial products. The sum is 112,941.

2. Multiply:

435
506
2610
2175
220,110

The second partial product by 0 is omitted, as it is 0; but care must be taken to place the first figure, 5, of the next partial product in the same column as the multiplier, 5, that is, in hundreds' column, under the 6.

3. Multiply:

354
210
3540
708
74,340

What is the shortest way of multiplying a number by 10? (See p. 137.) $210 = 21 \times 10$. Write the 1 of 21 under the units' figure of the multiplicand. $21 \times 354 = 7434$. Annex 0 to the right of 7434, making 74,340.

Multiply:

	a	*b*	*c*	*d*	*e*	*f*
4.	558	649	914	721	856	679
	413	557	876	534	349	421
5.	512	634	781	405	605	719
	404	305	206	107	550	850

6. Multiply mentally by 100: 5, 6, 50, 48, 39. Annex two 0's to the right of each number and compare the answers.

7. Multiply mentally by 1000: 5, 6, 50, 48, 39. Annex three 0's to the right of each number and compare the answers.

Learn: **Annexing two 0's to the right of a number multiplies it by 100, and annexing three 0's multiplies it by 1000.**

Multiply by 10; then by 100; then by 1000.

8. 65 89 40 104 507 900

9. Multiply 157 by 600.

157
600
94200

$600 = 6 \times 100$.
Write the 6 under the units' figure of the multiplicand. $6 \times 157 = 942$. Annex two 0's to the right of 942, making 94,200.

Multiply:

10.	11.	12.	13.
43	675	868	949
400	500	600	900

Find the products:

14. 185 by 200
15. 262 by 300
16. 341 by 500
17. 123 by 600
18. 214 by 700
19. 122 by 2000
20. 347 by 3000
21. 689 by 4000
22. 745 by 5000
23. 821 by 6000

SHORT DIVISION

In division, when the divisor is less than 13, the work is done mentally and not written out in full. This is called **short division.**

Thus, $6\overline{)672}$ $\quad 112$ $\quad 5\overline{)255}$ $\quad 51$ $\quad 7\overline{)2457}$ $\quad 351$ $\quad 11\overline{)3322}$ $\quad 302$ $\quad 12\overline{)1236.}$ $\quad 103$

Divide, and test your work by multiplication:

1. Divide 25650 by 5.
2. Divide 24344 by 8.
3. Divide 46287 by 9.
4. Divide 36474 by 6.
5. Divide 31260 by 6.
6. Divide 36470 by 7.
7. Divide 20544 by 8.
8. Divide 11106 by 9.
9. Divide 50325 by 5.
10. Divide 35552 by 4.
11. Divide 29997 by 3.
12. Divide 43632 by 8.
13. Divide 37251 by 9.
14. Divide 23643 by 9.
15. Divide 78440 by 4.
16. Divide 39426 by 3.
17. Divide 27426 by 7.
18. Divide 42376 by 2.
19. Divide 56840 by 10.
20. Divide 38604 by 12.
21. Divide 46387 by 11.
22. Divide 33330 by 11.
23. Divide 45912 by 12.
24. Divide 62070 by 10.
25. Divide 13574 by 11.
26. Divide 40200 by 10.
27. Divide 37476 by 12.
28. Divide 45122 by 11.

TO THE TEACHER. For further drill, require pupils to divide each of the above numbers by each of the numbers from 2 to 12 inclusive. To secure rapidity in dividing, it is well to have pupils give the partial quotients orally. Indicate the division on the board, thus: $5\overline{)4685.}$ Pupils give orally, nine, three, seven; quotient, 937.

LONG DIVISION

Long division is used when the work is all written.

STUDY RECITATION

1. Divide 156 by 13.

(*a*) Short Division Form:

$$13\overline{)156}$$
$$12$$

(*b*) Long Division Form:

$$\begin{array}{r} 12 \\ 13\overline{)156} \\ 13 \\ \hline 26 \\ 26 \\ \hline \end{array}$$

(*b*) Find the quotient figure 1, and write it above the 5, instead of below, as in short division. Then multiply the divisor 13 by 1 and write the product 13 under 15, the part of the dividend used. Subtract 13 from 15, writing the remainder, 2, below. To this remainder, 2, annex 6, the next figure in the dividend, making 26. 13 is contained in 26, 2 times. Write 2 over the 6 in the dividend. Multiply the divisor 13 by 2, and subtract the product 26 from 26. As there is no remainder, the division is exact.

Test. $13 \times 12 = 156$.

TO THE TEACHER. Pupils should see clearly that the mental work is exactly the same in both forms of division; but that in the Long Division form, the work of multiplying, subtracting, and annexing is all written out, while in the Short Division form the results are carried in the mind and nothing except the quotient is written.

In long division it is best to write each of the quotient figures *over* the last figure of the partial dividend used to produce it, as there is less liability of error in bringing down the proper figure for the next partial dividend.

Learn: **The remainder after each partial division must be less than the divisor.**

Solve the following by both short division and long division.

Divide:

2.	3.	4.	5.
13)273	14)294	15)165	16)336

The long division form should never be used when the divisor is 12 or less.

To find the quotient figures in long division when the second figure from the left in the divisor is small:

STUDY RECITATION

Divide:

1. $21\overline{)42}$ — Divide the left-hand figure in the dividend by the left-hand figure in the divisor. 2 in 4, 2 times. Write 2 for the quotient figure and multiply. There is no remainder.

2. $31\overline{)74}$ — In the same way: 3 in 7, 2 times. Write 2 for the quotient figure and multiply. The remainder, 12, is less than the divisor.

3. $61\overline{)120}$ — As the first figure at the left of the dividend will not contain the divisor, divide 12 by 6. 6 in 12, 2 times. The product of 61 by 2 is 122, which is larger than the dividend. The quotient figure 2 is too large. Substitute 1 for the 2, 1 time 61 is 61. Write 1 for the quotient figure over the 0. The remainder is less than the divisor.

In cases like example 3, the trial quotient figure must be decreased by 1. See p. 166, examples 27, 29, 30, 31, 33.

Find the quotient figure; multiply it by the divisor; and subtract the product, to see if the remainder is less than the divisor.

	a	*b*	*c*	*d*
4.	$21\overline{)42}$	$31\overline{)74}$	$41\overline{)87}$	$51\overline{)127}$
5.	$21\overline{)65}$	$31\overline{)65}$	$41\overline{)69}$	$51\overline{)235}$
6.	$21\overline{)87}$	$31\overline{)86}$	$41\overline{)54}$	$51\overline{)478}$
7.	$21\overline{)93}$	$31\overline{)93}$	$41\overline{)49}$	$51\overline{)374}$
8.	$21\overline{)75}$	$31\overline{)72}$	$41\overline{)78}$	$51\overline{)185}$
9.	$21\overline{)64}$	$31\overline{)46}$	$41\overline{)96}$	$51\overline{)278}$
10.	$21\overline{)53}$	$31\overline{)59}$	$41\overline{)82}$	$51\overline{)196}$

To find the first partial dividend, the first quotient figure, and its place.

STUDY RECITATION

Learn: **The first partial dividend has as many figures in it as there are figures in the divisor, or one more.**

If the divisor is greater than the number represented by the same number of figures on the left of the dividend, the first partial dividend contains *one more figure* than the divisor; otherwise, the same number. Before beginning the division in any case, see what figures make up the first partial dividend. Place the first figure of the quotient over the *last* figure of the first partial dividend.

Find the first quotient figure:

1. $21\overline{)1596}$ — The divisor 21 is greater than 15, the number represented by the first two figures

on the left of the dividend. There are two figures in the divisor, and three figures in the first partial dividend, or 159. Place the first figure of the quotient over 9, the last figure in the partial dividend.

2. $\begin{array}{r} 5 \\ 567\overline{)29484} \end{array}$ 567 is greater than 294. There are three figures in the divisor, and four figures in the first partial dividend, or 2948. Place the first figure of the quotient over 8, the last figure of the partial dividend.

3. $\begin{array}{r} 2 \\ 356\overline{)7832} \end{array}$ 356 is not greater than 783. There are three figures in the divisor, and three figures in the first partial dividend. Place the first figure of the quotient over 3, the last figure in the partial dividend.

4. $423\overline{)17766}$ 5. $326\overline{)2282}$ 6. $407\overline{)15466}$

How many figures are there in the first partial dividend in example 4? in example 5? in example 6?

7. $62\overline{)9114}$ Where should the first figure in the quotient be placed?

8. $54\overline{)1242}$ Where should the first figure in the quotient be placed?

What is the first partial dividend?

9. $\begin{array}{r} 55 \\ 52\overline{)2860} \\ 260 \\ \hline 260 \\ 260 \\ \hline \end{array}$ 5 is contained in 28, 5 times. Write 5 for the first quotient figure over 6, the last figure in the partial dividend. Multiply 52 by 5, and write the product under the partial dividend. Subtract. To the remainder, 26, annex 0, the next figure in the dividend. 5 is contained in 26, 5 times. Write 5 for the second figure in the quotient. Multiply 52 by 5 and subtract. As there is no remainder, 55 is the quotient.

10–12. Complete the division in examples 1, 7, and 8.

13. $2646 \div 42 = ?$
14. $3402 \div 63 = ?$
15. $1924 \div 74 = ?$
16. $3735 \div 83 = ?$
17. $1820 \div 52 = ?$
18. $3402 \div 54 = ?$
19. $2646 \div 63 = ?$
20. $2928 \div 61 = ?$
21. $3534 \div 62 = ?$
22. $2277 \div 33 = ?$
23. $2438 \div 53 = ?$
24. $1968 \div 24 = ?$
25. $3726 \div 54 = ?$
26. $2856 \div 34 = ?$
27. $5670 \div 70 = ?$
28. $5096 \div 52 = ?$

To find the quotient figures when the second figure from the left in the divisor is 7, 8, or 9.

PREPARATORY DRILL

1. Divide by 4, naming quotient and remainder:
14, 19, 17, 27, 35, 29, 33, 23, 15, 39, 31.

2. Divide by 5, naming quotient and remainder:
17, 27, 36, 49, 24, 28, 46, 43, 37, 32, 29.

3. Divide by 2, naming quotient and remainder:
14, 19, 17, 15, 11, 18, 13, 12, 21, 16, 20.

4. Multiply mentally first by 2; then by 3; then by 4; then by 5:
15, 16, 17, 18, 19, 24, 25, 27, 29, 34, 35.
39, 46, 52, 57, 64, 66, 73, 75, 82, 85, 93.

NOTE. When the second figure in the divisor is 7, 8, or 9, increase the first figure by 1 before dividing. The number obtained by dividing by the figure increased by 1 will nearly always be the correct quotient figure. In a few cases it will be 1 too small, and the next larger number must be taken for the quotient figure.

STUDY RECITATION

Divide:

1. $34\frac{7}{19}$

$19\overline{)653}$

57

83

76

7

As the second figure in the divisor is 9, increase the first figure by 1, making it 2. Divide the first figure in the dividend by 2. The quotient is 3. Place 3 for the first quotient figure above 5, the last figure in the first partial dividend. Multiply, subtract, bring down the next figure, and divide 8 by 2. The result is 4. Multiply the divisor by 4, and subtract. The remainder is found to be 7, which is written over the divisor at the right of 4, and read seven nineteenths.

MENTAL	WRITTEN
2. 3	42
$18\overline{)756}$	$18\overline{)756}$
54	72
21	36
	36

As the second figure in the divisor is 8, increase the first figure by 1. Divide the first figure in the dividend by 2. The quotient is 3.

Multiply 18 by 3, and subtract the product, 54, from 75. (This should be done mentally and without writing the product or remainder.) As the remainder, 21, is greater than the divisor, 18, the quotient figure is too small. Increase it by 1, making 4. Complete the division.

Divide: WRITTEN

	a	*b*	*c*	*d*	*e*
3.	$19\overline{)35}$	$19\overline{)41}$	$19\overline{)39}$	$29\overline{)65}$	$49\overline{)96}$
4.	$19\overline{)47}$	$19\overline{)55}$	$19\overline{)59}$	$29\overline{)83}$	$49\overline{)89}$
5.	$19\overline{)65}$	$19\overline{)62}$	$19\overline{)38}$	$29\overline{)95}$	$49\overline{)256}$
6.	$19\overline{)72}$	$19\overline{)71}$	$19\overline{)77}$	$29\overline{)156}$	$49\overline{)365}$
7.	$19\overline{)84}$	$19\overline{)88}$	$19\overline{)97}$	$29\overline{)214}$	$49\overline{)278}$

8. Divide by 28: 65, 83, 95, 156; by 29.

Use 30 for a trial divisor instead of 29 and 28.

9. Divide by 38: 86, 95, 127, 139; by 39.
10. Divide by 48: 96, 89, 156, 365; by 49.
11. Divide by 18: 144, 147, 162, 194; by 19.
12. Divide by 78: 297, 165, 237, 249; by 79.
13. Divide by 68: 272, 326, 178, 258; by 69.
14. Divide by 88: 352, 178, 267, 554; by 89.
15. Divide by 27: 54, 63, 79, 84; by 29; by 28.
16. Divide by 37: 74, 85, 142, 157; by 39; by 38.
17. Divide by 47: 85, 135, 212, 99; by 49; by 48.
18. Divide by 27: 315, 175, 196, 360; by 28.

Examples in which zeros occur in the quotient:

STUDY RECITATION

Divide:

1. $24\overline{)2568}$ (quotient 107; 24; 168; 168)

The first quotient figure is 1. Multiply, subtract, and bring down 6. The second partial dividend is 16. As 24 is not contained in 16, place a zero over 6, the figure brought down, and bring down 8, making the third partial dividend, 168. 7 is the third quotient figure, and there is no remainder.

WRITTEN

2. $5100 \div 25 = ?$
3. $28908 \div 36 = ?$
4. $40948 \div 58 = ?$
5. $16224 \div 32 = ?$
6. $23115 \div 23 = ?$
7. $11457 \div 57 = ?$
8. $36252 \div 36 = ?$
9. $7105 \div 35 = ?$
10. $24928 \div 82 = ?$

Examples in which the last figure in the quotient is zero.

STUDY RECITATION

Divide:

1. $48\overline{)12486}$ $260\frac{6}{48}$

$\begin{array}{r} 96 \\ \hline 288 \\ 288 \\ \hline 6 \end{array}$

After multiplying the divisor by the second figure, 6, of the quotient, you see that there is no remainder, but there is another figure in the dividend. Bring down the 6. As it does not contain 48, place a zero in the quotient over the 6. Write 6 to the right of the quotient, with the divisor underneath.

WRITTEN

2. $10754 \div 43$
3. $14260 \div 62$
4. $295687 \div 28$
5. $807240 \div 62$
6. $296675 \div 29$
7. $115507 \div 35$

Divisors ending in 0.

8. Divide 50 mentally by 10. Cut off the 0 from 50. Compare the two answers.

9. Divide mentally by 10: 40, 30, 60, 70, 500, 460, 5000. Cut off the 0 from the right of each of these numbers and compare the results with the quotient by 10.

10. Divide mentally by 100: 500, 600, 700, 2500. Cut off the two 0's from the right of each of these numbers and compare the results with the quotients by 100.

11. Divide mentally by 1000: 5000, 6000, 8000, 9000, 7000. Cut off the three 0's from the right of each of these numbers and compare answers.

Learn: **Removing one 0 from the right of a number divides it by 10, removing two 0's divides by 100, three 0's by 1000, etc.**

Find the quotients:

12.	$50 \div 10$	15.	$300 \div 100$	18.	$15{,}000 \div 1000$
13.	$500 \div 10$	16.	$900 \div 100$	19.	$25{,}000 \div 1000$
14.	$5000 \div 10$	17.	$5900 \div 100$	20.	$100{,}000 \div 1000$

21. $5\text{Ø})35\text{Ø}$, $\frac{7}{}$ 22. $5\text{ØØ})35\text{ØØ}$, $\frac{7}{}$ 23. $5\text{ØØØ})35\text{ØØØ}$, $\frac{7}{}$

Notice that the answers in Ex. 21 to 23 are the same.

Cutting off the same number of 0's from dividend and divisor does not change the quotient.

Find the quotients at sight:

24.	$120 \div 20$	27.	$2500 \div 50$	30.	$14000 \div 1000$
25.	$400 \div 80$.	28.	$4200 \div 700$	31.	$12000 \div 6000$
26.	$280 \div 70$	29.	$6400 \div 800$	32.	$45000 \div 9000$

STUDY RECITATION

Divide:

33.
$$\begin{array}{r} 267\frac{8}{10} \\ 10\overline{)2678} \\ 20 \\ \hline 67 \\ 60 \\ \hline 78 \\ 70 \\ \hline 8 \end{array}$$

34.
$$\begin{array}{r} 26\frac{78}{100} \\ 100\overline{)2678} \\ 200 \\ \hline 678 \\ 600 \\ \hline 78 \end{array}$$

35.
$$\begin{array}{r} 2\frac{678}{1000} \\ 1000\overline{)2678} \\ 2000 \\ \hline 678 \end{array}$$

In Ex. 33, what figures in the dividend are found in the quotient? Which figure of the dividend is the remainder? in Ex. 34? in Ex. 35?

In dividing a number not ending in 0 by 10, the last figure is the remainder and the other figures are the quotient. In dividing such a number by 100, the last two figures are the remainder. In dividing it by 1000, the last three figures are the remainder.

WRITTEN

Divide each of these numbers by 10, 100, and 1000:

36.	2784	38.	2735	40.	39,566	42.	57,947
37.	5692	39.	56,957	41.	4682	43.	36,972

To divide dividends not ending in 0 when the divisor contains 0 on the right.

STUDY RECITATION

Divide:

1. $20\overline{)4695}$ $= 234\frac{15}{20}$

$$\begin{array}{r} 40 \\ \hline 69 \\ 60 \\ \hline 95 \\ 80 \\ \hline 15 \end{array}$$

2. $2|0\overline{)469}|5$ $= 234\frac{15}{20}$

In example 1 the quotient is 234 and the remainder is 15. In example 2, before dividing, cut off the zero at the right of the divisor, and the right-hand figure of the dividend. Divide the remaining portion of the dividend by 2. The remainder from the division by 2 is 1. Annex the figure cut off from the dividend to the 1, making the complete remainder 15.

If there are two 0's on the right of the divisor, cut them both off and cut off two figures from the right of the dividend before dividing.

WRITTEN

3.	$2356 \div 20$	6.	$1843 \div 30$	9.	$2563 \div 120$
4.	$1498 \div 20$	7.	$4652 \div 40$	10.	$3764 \div 130$
5.	$3572 \div 20$	8.	$7875 \div 50$	11.	$4563 \div 140$

To divide when the divisor contains more than two figures (not including 0).

STUDY RECITATION

Divide:

1. $53\overline{)130248}$ — $2457\frac{27}{53}$

106
242
212
304
265
398
371
27

2. $536\overline{)130248}$ — 243

1072
2304
2144
1608
1608

In example 1, to find the first quotient figure, divide 13 on the left of the dividend by 5. The first quotient figure is 2. 53 is more than 13, so there are 3 figures in the first partial dividend, 130. Write the quotient figure 2 over the last figure, 0, in the partial dividend. Multiply, subtract, and bring down the next figure in the dividend. The second partial dividend is 242. Complete the work as in previous examples when the divisor is made up of two significant figures.

In example 2, the dividend is the same as in example 1. The divisor has three figures, the first two of which are the same as in example 1. To find the first quotient figure, proceed as in 1, dividing 13 by 5. The quotient figure is 2. 536 is more than 130, so there are four figures in the first partial dividend, 1302. Write the quotient figure 2 over the last figure in the partial dividend. Multiply, subtract, and bring down the next figure of the dividend. The second partial dividend is 2304. Divide the 23 by 5 for the second figure in the quotient, or 4. Multiply, subtract, and bring down the next figure of the dividend. The last

partial dividend is 1608. Divide 16 by 5 for the next figure of the quotient. The third figure, 6, in the divisor is not used in finding the trial quotient figures. If there were four or five figures in the divisor, the quotient figures would be found in most cases by using only the first two on the left.

WRITTEN

3. 407,391 ÷ 687
4. 836,847 ÷ 963
5. 566,955 ÷ 645
6. 8094 ÷ 426
7. 6276 ÷ 523
8. 16,748 ÷ 4187

REVIEW

WRITTEN

Divide and test:

1. 315 by 21
2. 682 by 31
3. 2356 by 31
4. 2244 by 51
5. 4836 by 62
6. 3528 by 72
7. 3198 by 82
8. 2408 by 43
9. 5724 by 53
10. 6528 by 64
11. $ 247.26 by 78
12. $ 799.00 by 85
13. $ 100.58 by 47
14. $ 745.20 by 36
15. $ 420.67 by 59
16. 3150 by 210
17. 6820 by 310
18. 2640 by 660
19. 6720 by 840
20. 4680 by 520
21. 86,580 by 130
22. 19,440 by 240
23. 17,500 by 350
24. 55,220 by 502
25. 54,064 by 124
26. $ 307.71 by 263
27. $ 489.84 by 314
28. $ 255.24 by 709
29. $ 788.61 by 813
30. $ 347.76 by 621

REVIEW

Written

31.	4536 ÷ 21	53.	64,680 ÷ 66
32.	11,904 ÷ 31	54.	31,080 ÷ 30
33.	32,004 ÷ 42	55.	50,854 ÷ 94
34.	41,676 ÷ 92	56.	56,394 ÷ 78
35.	28,589 ÷ 23	57.	19,203 ÷ 37
36.	3472 ÷ 62	58.	13,500 ÷ 54
37.	3486 ÷ 83	59.	35,819 ÷ 43
38.	20,667 ÷ 83	60.	35,920 ÷ 20
39.	27,048 ÷ 92	61.	13,566 ÷ 57
40.	5772 ÷ 74	62.	19,266 ÷ 38
41.	727,748 ÷ 98	63.	6939 ÷ 257
42.	211,044 ÷ 86	64.	14,504 ÷ 98
43.	41,220 ÷ 45	65.	19,836 ÷ 76
44.	460,404 ÷ 58	66.	62,500 ÷ 500
45.	52,542 ÷ 63	67.	104,328 ÷ 504
46.	18,012 ÷ 57	68.	266,688 ÷ 576
47.	27,540 ÷ 68	69.	421,026 ÷ 141
48.	25,623 ÷ 39	70.	680,264 ÷ 422
49.	11,640 ÷ 40	71.	709,050 ÷ 326
50.	10,800 ÷ 50	72.	816,511 ÷ 389
51.	77,700 ÷ 74	73.	920,550 ÷ 475
52.	10,260 ÷ 95	74.	654,461 ÷ 641

75. A man paid $13,940 for land at $85 an acre. How many acres did he buy?

76. A man sells his crop of 3650 pounds of tobacco at 13¢ per pound. How much does he receive for the crop? Prove your work by division.

77. In a strawberry bed there are 1920 plants. There are 48 plants in each row. How many rows are there?

78. If John picks 15 quarts of strawberries from each row, how many rows will yield 600 quarts?

79. If John receives $60 for 600 quarts of strawberries, how much does he receive per quart?

80. If it costs him $18 for marketing 600 quarts, how much does it cost per quart?

81. The distance between two cities is 918 miles. If a man goes from one to the other by rail in 18 hours, at what rate per hour does he travel?

82. A man divides his estate worth $4800 among his wife and four children. The wife has $\frac{1}{3}$ of the estate and the children share the remainder equally. What is the share of the wife? of each child?

83. A man buys 75 telephone poles for $37.50. What is the cost per pole? How much would 90 poles cost at the same rate? What is the first question to be answered in solving this problem? the second question?

84. A grapefruit grower ships 3600 grapefruits in boxes holding 60 each. How many boxes are there?

REVIEW

ORAL AND WRITTEN

1. A man earns $2 a day for 6 days in the week. He pays $4 a week for board and $3 a week for other expenses. How many dollars can he save in 6 weeks?

2. $8+6, \div 2, \times 8, -6, \div 5, +8, \div 6, +21, \div 12 = ?$

When numbers are written, as in example 2, with a comma after each, perform the operations in order, as indicated by the signs.

3. A man has a farm containing 80 acres. $\frac{1}{4}$ of the farm is a wood lot, $\frac{3}{8}$ of the farm is sown in wheat, $\frac{1}{8}$ of the farm is planted with corn, and the rest is planted with potatoes. Make and answer as many questions on the above as possible.

4. How many inches equal 8 ft. and 9 in.?

The abbreviation **in.** is used for inch, **ft.** for foot or feet, **yd.** for yard or yards.

5. A room is 6 yd. long and 5 yd. wide. Draw the floor on a scale of 1 inch to 1 foot. The floor is carpeted with strips of carpet 1 yd. wide, running lengthwise of the floor. How many strips will it take to cover the floor? How many yards of carpet are there in each strip? How many yards does it take to cover the floor? Show by dotted lines on your diagram where the carpet is joined.

6. A garden is 3 rods wide and 5 rods long. Draw it on a scale of 1 inch to 1 rod. How long is a fence that surrounds the garden?

7. A dealer buys 8 tons of coal at $4 a ton, and sells the coal so as to gain $8. For how much does he sell it? What is the selling price per ton? What is the gain per ton?

8. A dealer buys 65 horses at $75 each. He sells them so as to gain $325 on all of them. For how much does he sell them? What is the selling price of each? the gain on each? Compare with problem 7.

9. A dealer buys 65 horses for $75 each, and sells them for $80 each. How much does he gain on all the horses? on each horse? Compare with problem 8 and tell how it differs from that problem.

10. A dealer sells 65 horses at $80 each and gains $325. How much does he pay for the horses? How much for each horse? Compare with problem 8 and tell how it differs from that problem.

11. When the cost and the gain are known, how can you find the selling price? When the cost and the selling price are known, how can you find the gain or the loss? When the selling price and the gain or loss are known, how can you find the cost?

12. Find the cost of sending a telegram of 25 words from Chicago to New York, at 40¢ for the first ten words and 3¢ for each additional word.

13. How much will it cost to talk over a long-distance telephone for 9 minutes, at 50¢ for the first 3 minutes and 15¢ for each additional minute?

14. A grocer buys 4 bu. of plums at $2.50 a bushel, and sells them at 10¢ a quart. How much does he gain? (32 qt. = 1 bu.) Solve by question and answer.

15. A grocer buys vinegar at 24¢ a gallon and sells it at 10¢ a quart. How much does he gain on 1 gallon? How much does he gain on 10 gallons?

16. The rate for sending parcels a distance of 1800 miles is as follows: 1 pound 11¢, 2 pounds 21¢, and each additional pound 10¢ extra. Find the cost of sending a distance of 1800 miles, a package of seeds weighing 3 pounds, a package of farm products weighing 10 pounds, and a box of clothing weighing 8 pounds.

17. A field is 10 rods wide and 30 rods long. How many rods of wire will it take to put a 3-wire fence around the field?

18. A man earns $85 a month. His expenses are $720 a year. How much can he save in 2 years?

19. A mill makes 9212 pounds of flour a day. How many barrels of 196 pounds will it make in 6 days?

20. A's farm is worth $3200. B's farm is worth $\frac{5}{8}$ as much. How much are both farms worth? Analyze.

21. *A* ——— *B* ——— *C* ——— *D*

The distance from *A* to *B* is 280 miles; from *B* to *C*, 245 miles; from *C* to *D*, 315 miles. How far is it from *A* to *D* and back? from *A* to *C*? from *B* to *D*?

22. At 40 miles an hour, how long will it take you to go from *A* to *B*? from *B* to *C*? from *A* to *D* and back?

23. $\frac{3}{4}$ of 180 are how many more than $\frac{2}{3}$ of the same number?

24. A real estate dealer bought three houses, paying for them \$3500, \$2750, and \$1975. He sold them all for \$1825 more than they cost. For how much did he sell them? State the first question to be answered in solving the problem.

25. An ocean steamer goes 400 miles in one day; 460 miles a day for the next two days; and 428 miles a day for the next three days. What is the entire distance it goes in the six days?

26. A has \$250; B has twice as much as A; C has $\frac{1}{3}$ as much as A and B together. How much have they all together?

27. $8 \times 6, +2, \div 5, +6, \div 4, \times 12, -12, \div 6, +9 = ?$

28. $24 + 9, +8, +4, \div 5, +8, -5, \times 12, -6, -8, -4 = ?$

29. $6 \times 7, +6, \div 8, \times 5, +3, \div 11, \times 20, \div 6, \times 10, -9 = ?$

Find the sums:

30.	31.	32.	33.
684	\$24.50	\$3.56	\$46.72
396	37.64	7.28	52.12
578	18.47	1.14	63.75
493	9.72	9.63	48.09
679	15.06	2.75	72.00
584	27.33	.84	15.96

34. A farmer buys 24 cows for $ 864. What is the average price? Prove your work. Analyze.

35. John travels 40 miles in one day, and James travels $\frac{7}{8}$ as far. How far does James travel?

36. Change the last problem by putting a 2 before the 40, making it 240.

37. Change the problem further by making the fraction $\frac{5}{6}$.

38. John has 24 cents, which is $\frac{1}{4}$ of the number James has. How many has James? Analyze.

39. There are 16 boys in a class. There are $\frac{7}{8}$ as many girls in the class. How many girls are there in the class?

40. There are 16 girls in a class. The number of boys is $\frac{3}{4}$ the number of girls. How many boys are there in the class?

41. The width of a room is $\frac{3}{4}$ of its length. It is 24 feet long. How wide is it?

42. The width of a room is $\frac{7}{8}$ of its length. It is 32 feet long. How wide is it?

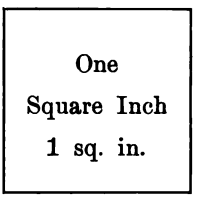
43. A room is 40 feet long. The width is $\frac{7}{10}$ of the length. How wide is it?

44. A train travels 40 miles an hour. How much farther does it travel in $\frac{4}{5}$ of an hour than in $\frac{3}{8}$ of an hour? Analyze.

45. Find $\frac{1}{2}$ of 40; $\frac{2}{4}$ of 40; $\frac{4}{8}$ of 40; $\frac{5}{10}$ of 40. Compare the answers.

SQUARE MEASURE

A **rectangle** is a flat surface bounded by four straight lines and having four square corners or angles.



A **square** is a surface bounded by four *equal* lines, and having four equal angles. The lines at the corners make **right angles.**

Square measure is used in measuring surfaces.

The figure at the right has four equal sides and four right angles or square corners. It is a square. As each side is 1 inch long, the surface inside the lines is a square inch.

A **square inch** is a square surface 1 inch long and 1 inch wide.

A **square foot** is a square surface 1 foot long and 1 foot wide.

A **square yard** is a square surface 1 yard long and 1 yard wide.

Draw each of these squares on the board.

Divide the square foot into square inches.

Divide the square yard into square feet.

The distance around a square or a rectangle is called its **perimeter.**

What is the perimeter of a square inch? a square foot? a square yard?

A **square rod** is a square surface 1 rod long and 1 rod wide. With a tape measure or a line 1 rod long, lay out a square rod on the floor of the schoolroom.

Learn:

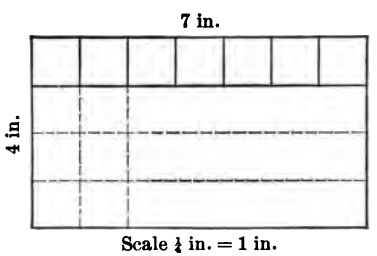
TABLE

144 square inches (sq. in.)	**= 1 square foot (sq. ft.)**
9 square feet	**= 1 square yard (sq. yd.)**
30¼ square yards	**= 1 square rod or perch (sq. rd.)**
160 square rods	**= 1 acre (A.)**
640 acres	**= 1 square mile (sq. mi.)**

ORAL

1. How many square feet = 5 sq. yd.? 6 sq. yd.?
2. How many square yards = 27 sq. ft.? 81 sq. ft.?
3. How many square inches = ½ sq. ft.? ¼ sq. ft.?
4. 12 sq. in. are what part of a square foot?
5. 24 sq. in. are what part of a square foot?
6. 3 sq. ft. are what part of a square yard?
7. 18 sq. ft. are how many square yards?
8. How many square rods equal ½ A.? ⅛ A.? ⅜ A.?

STUDY RECITATION



This figure represents a rectangle 7 in. long and 4 in. wide drawn on a scale of ¼ inch to 1 inch. How many square inches are there in the upper row of squares? How many inch rows are there? How many square inches are there in its surface?

Learn: **The number of square units in the surface of a rectangle (or its *area*) is equal to the number of units in its length multiplied by the number of like units in its width.**

The number of square inches in the area of the rectangle on p. 182 is 7×4, or 28. Area = 28 square inches.

NOTE. As a square is a rectangle having equal sides, its dimensions are alike. The area of a 2-inch square is 2×2 (square inches), or 4 square inches.

ORAL

Find the area and the perimeter of each of the following squares:

	SIDES		SIDES		SIDES		SIDES
1.	9 in.	3.	2 ft.	5.	40 rd.	7.	10 yd.
2.	12 in.	4.	3 ft.	6.	20 rd.	8.	20 yd.

Find the area and the perimeter of each of the following rectangles:

	DIMENSIONS		DIMENSIONS
9.	4 ft. long, 2 ft. wide	14.	12 yd. long, 3 yd. wide
10.	5 in. long, 3 in. wide	15.	10 in. long, 4 in. wide
11.	6 yd. long, 7 yd. wide	16.	8 yd. long, 6 yd. wide
12.	7 ft. long, 8 ft. wide	17.	7 ft. long, 4 ft. wide
13.	8 in. long, 9 in. wide	18.	9 ft. long, 7 ft. wide

WRITTEN

Draw, as indicated, and find the area and the perimeter of the following rectangles:

19. 8 in. by 5 in.; scale $\frac{1}{4}$ in. = 1 in.

20. 12 in. by 14 in.; scale $\frac{1}{2}$ in. = 1 in.

21. 25 in. by 15 in.; scale $\frac{1}{5}$ in. = 1 in.

22. 16 ft. by 14 ft.; scale $\frac{1}{4}$ in. = 1 ft.

23. 20 yd. by 16 yd.; scale $\frac{1}{4}$ in. = 1 yd.

24. 64 yd. by 32 yd.; scale $\frac{1}{16}$ in. = 1 yd.

25. 15 ft. by 15 ft.; scale $\frac{1}{10}$ in. = 1 ft.

26. Make a drawing on a scale of 1 inch to 1 foot to represent a desk 4 ft. long by 5 ft. wide. What is the area of this desk? the perimeter?

27. Make a drawing on a scale of 1 inch to 2 feet to represent a blackboard 18 feet long and 5 feet wide. What is the area of the blackboard? the perimeter?

28. Make a drawing on a scale of 1 inch to 1 foot to represent a rug 13 ft. long and 14 ft. wide. How many square feet are there in this rug?

29. If your school ground is 350 feet long and 150 feet wide, what is its area in square feet? Draw a diagram to represent this on a scale of 1 inch to 50 feet.

30. Measure the length and the width of each of the rooms in your house. Draw diagrams to represent them, on suitable scales, and find their areas.

31. Find the scale of the map of Indiana in your geography. Then measure the map and calculate the area approximately. Do the same with the map of Wisconsin.

32. How many square inches = 7 sq. ft.? 9 sq. ft.?

33. How many square feet = 45 sq. yd.? 7 sq. yd.?

34. How many square yards and square feet = 65 sq. ft.? 278 sq. ft.? 356 sq. ft.? 215 sq. ft.?

35. A floor is 18 ft. wide and 20 ft. long. How many square feet are there in its surface? how many square yards?

36. A garden is 6 rd. long and 4 rd. wide. How many square rods are there in its area? How many rods are there in its perimeter?

37. If the garden is laid out in beds 1 rd. long and $\frac{1}{2}$ rd. wide, how many such beds are there in the garden? Show by a diagram.

38. A room is 5 yd. long and 4 yd. wide. How many square yards of carpeting will it take to cover the floor?

39. A piece of linen intended for a doily is 10 inches square. After the edge is fringed 1 inch deep, how many square inches will there be in the center of the doily?

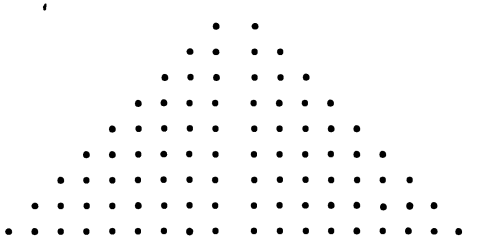
40. The pattern for a doll's dress requires a piece of lawn 15 inches wide by 18 inches long. How many dresses could you cut from a yard, if the cloth is 30 inches wide?

41. How many 2-inch blocks will it take to make a doll's quilt 12 inches wide and 14 inches long?

42. A class of 27 girls each needed a piece of cambric 12 inches square. How many yards of cambric 1 yard wide did the teacher have to get?

FRACTIONS

STUDY RECITATION



What number of dots are there in each line? How many groups of dots are there in each line? What number of dots are there in each group?

The number of dots in each line is divided into two equal parts. Each of the two equal parts of any number is *one half* (also written $\frac{1}{2}$) the number. Two halves of any number together equal the whole of it.

1. What is $\frac{1}{2}$ of 2 dots? What are $\frac{2}{2}$ of 2 dots?
2. What is $\frac{1}{2}$ of 4 dots? What are $\frac{2}{2}$ of 4 dots?
3. What is $\frac{1}{2}$ of 6 dots? What are $\frac{2}{2}$ of 6 dots?
4. What is $\frac{1}{2}$ of 8 dots? What are $\frac{2}{2}$ of 8 dots?
5. What is $\frac{1}{2}$ of 10 dots? What are $\frac{2}{2}$ of 10 dots?
6. What is $\frac{1}{2}$ of 12 dots? What are $\frac{2}{2}$ of 12 dots?
7. What is $\frac{1}{2}$ of 14 dots? $\frac{1}{2}$ of 16 dots? $\frac{1}{2}$ of 18 dots? $\frac{1}{2}$ of 20 dots?

TO THE TEACHER. Have pupils separate different even numbers of objects into two equal parts, and drill them in telling the whole number, the number in each half, the numbers in two halves. Have pupils put even numbers of dashes, dots, circles, squares, etc., on paper or blackboard, separating each number into two equal groups.

When two numbers are written one above, the other below, a line, as $\frac{3}{4}$, they are called a **fraction.**

The number above the line is the **numerator.**

The number below the line is the **denominator.**

The two numbers used in a fraction are called **terms** of the fraction.

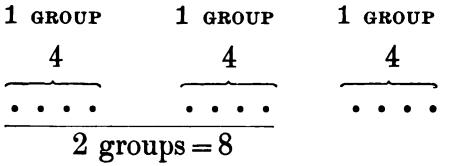
8. What are the terms of the following fractions?

$\frac{1}{2}$ $\frac{3}{4}$ $\frac{4}{5}$ $\frac{5}{6}$ $\frac{7}{8}$ $\frac{9}{10}$

9. What are the numerators of the six fractions?

10. What are the denominators of the six fractions?

$\frac{2}{3}$ of 12 dots means that the 12 dots are divided into 3 groups and that 2 of these groups are taken, thus:



$\frac{2}{3}$ of 12. We divide 12 by 3 to divide the number into 3 equal parts. $\frac{1}{3}$ of $12 = 4$. If we take 2 parts, we take 2 times 4, or 8.

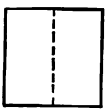
The **denominator,** 3, shows into how many parts the number is divided.

The **numerator,** 2, shows how many of the parts are taken.

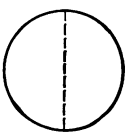
11. $\frac{4}{5}$ of a number shows that the number is to be divided into —— parts, and that —— parts are to be taken. $\frac{4}{5}$ of $20 = ?$

If the line A———C———B is divided into two equal parts, each of the parts, AC and BC, is $\frac{1}{2}$ of the whole line.

12. If the square is divided into two rectangles by the dotted line, each rectangle is what part of the square?



13. If the circle is divided into two equal parts by the dotted line, each part is what part of the circle?



14. One half of the unit 1 is $\frac{1}{2}$.

– – – – There are 4 lines in this row; each line is what part of the whole number of lines, or of the 4 lines combined into 1 line ———?

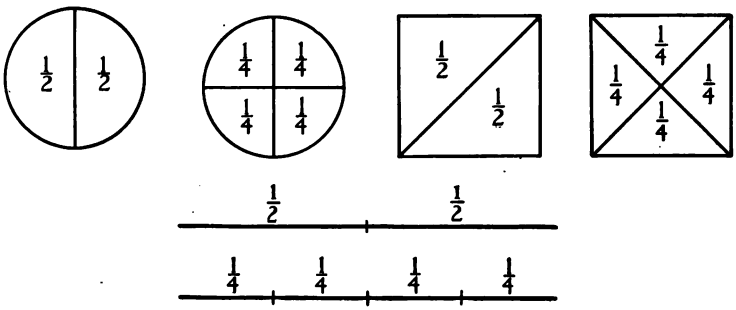
A unit is a single thing; as, 1 line; 1 dot; 1 dollar; 1.

– – – – 1 of the 4 lines is a unit. If the 4 lines are combined, end to end, so as to make 1 line, as ———, then this line becomes a unit, because it is now 1 line instead of 4 separate lines.

If the line is now separated into 4 equal parts, as – – – –, then each part becomes a unit again, but is a smaller unit than the whole line from which it was taken. Each of these equal units is a fractional part of the large unit, the whole line; it is $\frac{1}{4}$ of it. It is called a **fractional unit.**

15. Divide a line into 5 equal parts. What is the fractional unit of each part? Write the fraction that represents 2 of these parts; 3 parts.

HALVES AND FOURTHS



1. Draw a circle, a square, and a line, and divide each into 2 equal parts. How many halves of a circle are there in a circle? Ask and answer similar questions about the square and the line. $\frac{2}{2} = 1$.

2. Draw a circle, a square, and a line, and divide each into 4 equal parts. How many fourths of a circle are there in a circle? Ask and answer similar questions about the square and the line. $\frac{4}{4} = 1$.

3. $\frac{1}{2} + \frac{1}{2} = \frac{?}{2}$ $\frac{2}{2} - \frac{1}{2} = \frac{?}{2}$ $\frac{1}{4} + \frac{1}{4} = \frac{?}{4}$ $\frac{2}{4} + \frac{1}{4} = \frac{?}{4}$

4. $\frac{1}{2} = \frac{?}{4}$ $\frac{2}{2} = \frac{?}{4}$ $\frac{2}{4} = \frac{?}{2}$

5. How much greater is one half than one fourth?

6. $\frac{1}{2} - \frac{1}{4} = \frac{?}{4}$ $\frac{1}{2} + \frac{1}{4} = \frac{?}{4}$ $\frac{1}{4} + \frac{1}{4} + \frac{1}{4} = \frac{?}{4}$

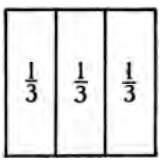
7. How many units are there in $\frac{2}{2}$? in $\frac{4}{4}$?

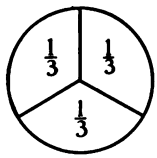
8. How many halves are there in 2 units? in 4 units?

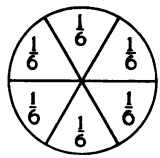
9. How many fourths are there in 2 units? in 4 units?

10. $\$\frac{1}{2} + \$\frac{1}{4} = \$\frac{?}{4}$ $\$\frac{1}{2} - \$\frac{1}{4} = \$\frac{?}{4}$ $\$\frac{3}{4} - \$\frac{1}{4} = \$\frac{?}{4}$

THIRDS AND SIXTHS







1. How many thirds of the rectangle are there in the rectangle? Study also the first circle. $\frac{3}{3} = 1$ unit.

2. How many thirds are $\frac{1}{3} + \frac{1}{3}$?

3. $\frac{1}{3} + \frac{1}{3} + \frac{1}{3} = \frac{?}{3}$ $\quad \frac{3}{3} - \frac{2}{3} = \frac{?}{3}$ $\quad \frac{3}{3} - \frac{1}{3} = \frac{?}{3}$

4. How many sixths are there in a unit? $\frac{6}{6} = 1$ unit.

5. $\frac{1}{3}$ of a circle $= \frac{?}{6}$ of a circle; $\frac{2}{3}$ of a circle $= \frac{?}{6}$ of a circle; $\frac{3}{3}$ of a circle $= \frac{?}{6}$ of a circle.

6. $\frac{1}{3} = \frac{?}{6}$ $\quad \frac{2}{3} = \frac{?}{6}$ $\quad \frac{3}{3} = \frac{?}{6}$ $\quad \frac{1}{3} + \frac{1}{6} = \frac{?}{6}$ $\quad \frac{1}{3} - \frac{1}{6} = \frac{?}{6}$

7. $\frac{4}{3} = 1$ and $\frac{1}{3}$, written $1\frac{1}{3}$; $\frac{7}{4} = 1\frac{3}{4}$; $\frac{7}{6} = ?$ $\quad \frac{11}{6} = ?$ $\quad \frac{5}{3} = ?$ $\quad \frac{5}{4} = ?$

8. Add: $4\frac{1}{3}$, $1\frac{2}{3}$, 6 $\quad \frac{1}{3} + \frac{2}{3} = \frac{3}{3}$, or 1; $4 + 1 = 5$; $5 + 1 = 6$.

9. Subtract: $5\frac{2}{3}$, $3\frac{1}{3}$, $2\frac{1}{3}$ $\quad \frac{2}{3} - \frac{1}{3} = \frac{1}{3}$; $5 - 3 = 2$.

10. Add:

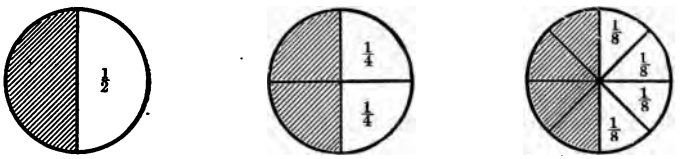
a	*b*	*c*	*d*	*e*	*f*
$2\frac{1}{3}$	$5\frac{1}{3}$	$3\frac{1}{6}$	$4\frac{1}{2}$	$3\frac{1}{4}$	$6\frac{3}{4}$
$1\frac{1}{3}$	$4\frac{2}{3}$	$2\frac{5}{6}$	$3\frac{1}{2}$	$2\frac{1}{4}$	$5\frac{1}{4}$

11. Subtract:

$4\frac{1}{2}$	$5\frac{1}{2}$	$4\frac{3}{4}$	$6\frac{2}{3}$	$7\frac{5}{6}$	$5\frac{1}{6}$
2	$3\frac{1}{2}$	$2\frac{1}{4}$	$5\frac{1}{3}$	$3\frac{1}{6}$	3

HALVES, FOURTHS, AND EIGHTHS

1 unit = $\frac{2}{2}$. 1 unit = $\frac{4}{4}$. 1 unit = $\frac{8}{8}$.



$\frac{1}{2}$ = $\frac{2}{4}$ = $\frac{4}{8}$.

1. Into how many equal parts is the first circle divided? the second circle? the third circle?

2. How many eighths of a circle are there in the third circle? $\frac{8}{8} = ?$ $\frac{4}{4} = ?$ $\frac{2}{2} = ?$

3. Compare $\frac{1}{2}$ and $\frac{2}{4}$ of a circle; $\frac{1}{2}$ and $\frac{4}{8}$ of a circle.

Learn: $\boxed{\frac{1}{2} = \frac{2}{4} = \frac{4}{8}.}$

4. $\frac{1}{8}$ is what part of $\frac{1}{4}$? $\frac{1}{4}$ is what part of $\frac{1}{2}$?

5. $\frac{3}{8} + \frac{1}{8} = \frac{?}{8}$ $\frac{2}{8} + \frac{1}{8} = \frac{?}{8}$ $\frac{3}{8} - \frac{1}{8} = \frac{?}{8}$.

6. $\frac{6}{8} - \frac{3}{8} = \frac{?}{8}$ $\frac{5}{8} - \frac{2}{8} = \frac{?}{8}$ $\frac{3}{4} - \frac{2}{4} = \frac{?}{4}$.

7. Add:

a	*b*	*c*	*d*	*e*	*f*
$1\frac{1}{2}$	$1\frac{1}{4}$	$5\frac{1}{8}$	$2\frac{7}{8}$	$4\frac{5}{8}$	$3\frac{7}{8}$
$2\frac{1}{2}$	$3\frac{2}{4}$	$4\frac{3}{8}$	$1\frac{1}{8}$	$3\frac{2}{8}$	2

8. Subtract:

$5\frac{1}{2}$	$6\frac{3}{4}$	$4\frac{7}{8}$	$5\frac{6}{8}$	$6\frac{6}{8}$	$4\frac{3}{8}$
$3\frac{1}{2}$	$2\frac{1}{4}$	$3\frac{3}{8}$	$3\frac{1}{8}$	5	2

OTHER FRACTIONAL PARTS

To the Teacher. Use diagrams of circles, squares, lines, etc., to develop this work, as on pages 189 to 191.

1. Write 1 cent as the fractional part of a nickel. How many fifths are there in 1 unit? in 2 units?

2. $\frac{1}{5}+\frac{2}{5}=?$ $\frac{4}{5}-\frac{3}{5}=?$ $1\frac{1}{5}+\frac{1}{5}=?$ $2\frac{3}{5}-1\frac{2}{5}=?$

3. Write 1 day as a fractional part of a week. How many sevenths are there in 1 unit? in 2 units?

4. $\frac{2}{7}+\frac{1}{7}=\frac{?}{7}$ $\frac{6}{7}-\frac{5}{7}=\frac{?}{7}$ $\frac{6}{7}-\frac{3}{7}=\frac{?}{7}$ $\frac{4}{7}+\frac{3}{7}=\frac{?}{7}$.

5. How many ninths are there in 1 unit? in 3 units?

6. $\frac{1}{9}+\frac{2}{9}=\frac{?}{9}$ $\frac{3}{9}=\frac{?}{3}$ $\frac{1}{3}=\frac{?}{9}$ $\frac{1}{9}+\frac{5}{9}=\frac{?}{9}=\frac{?}{3}$ $\frac{5}{9}-\frac{4}{9}=?$

7. Write 1 cent as a fractional part of a dime. How many tenths of a cent are there in 1 cent?

8. $\frac{10}{10}=?$ $\frac{5}{10}=\frac{?}{2}$ $\frac{4}{10}=\frac{?}{5}$ $\frac{3}{10}+\frac{2}{10}=\frac{?}{10}=\frac{?}{2}$ $\frac{7}{10}-\frac{2}{10}=\frac{?}{10}=\frac{?}{2}$

9. Write 1 as a fractional part of a dozen. How many twelfths are there in 1 unit? $\frac{4}{12}=\frac{?}{3}$ $\frac{6}{12}=\frac{?}{2}$

10. $\frac{4}{12}+\frac{4}{12}=\frac{?}{12}=\frac{?}{6}$ $\frac{7}{12}-\frac{1}{12}=\frac{?}{12}=\frac{?}{2}$

11. How many 16ths are there in 1? $\frac{8}{16}=\frac{?}{2}$ $\frac{4}{16}=\frac{?}{4}$.

12. Add:

a	*b*	*c*	*d*	*e*	*f*
$2\frac{1}{7}$	$3\frac{1}{9}$	$6\frac{1}{10}$	$5\frac{1}{12}$	$7\frac{4}{12}$	$6\frac{5}{16}$
$1\frac{3}{7}$	$1\frac{4}{9}$	$2\frac{5}{10}$	$3\frac{2}{12}$	$5\frac{3}{12}$	4

13. Subtract:

$3\frac{4}{7}$	$5\frac{5}{9}$	$6\frac{3}{10}$	$4\frac{5}{12}$	$7\frac{7}{8}$	$4\frac{7}{16}$
$2\frac{1}{7}$	$2\frac{3}{9}$	$2\frac{1}{10}$	$1\frac{3}{12}$	$3\frac{2}{8}$	$1\frac{1}{16}$

TO THE TEACHER. Draw an oblong, 2 inches by 12 inches, and divide it into inch squares. Require pupils to show that $\frac{1}{2}$ of the whole number of squares equals $\frac{6}{12}$ of the whole number; $\frac{3}{6}$ of the whole number; $\frac{6}{12}$ of the whole number; that $\frac{1}{4}$ of the whole number of squares equals $\frac{3}{12}$ of the whole number; $\frac{3}{12}$ of the whole number.

14. Show that $\frac{2}{6}$ of 12 dots is the same as $\frac{1}{3}$ of 12 dots.

15. Show that $\frac{3}{6}$ of 12 dots is the same as $\frac{1}{2}$ of 12 dots.

16. Show that $\frac{4}{6}$ of 12 dots is the same as $\frac{2}{3}$ of 12 dots.

17. Show that $\frac{2}{6}$ of 12 is the same as $\frac{1}{3}$ of 12.

$\frac{1}{6}$ of $12 = 2$. $\frac{2}{6}$ of $12 = ?$ $\frac{1}{3}$ of $12 = 4$.

18. Find $\frac{2}{6}$ of 18. How many thirds of 18 does this number equal?

19. Find $\frac{3}{9}$ of 18. How many thirds of 18 does this number equal?

20. Name three fractional parts of 18 that are equal.

21. Find the same parts of 36 and see whether they are equal.

Learn:

$\frac{1}{3}$, $\frac{2}{6}$, and $\frac{3}{9}$ of a number are equal. $\frac{1}{3}$, $\frac{2}{6}$, and $\frac{3}{9}$ are equal.

22. Show that $\frac{1}{2}$, $\frac{2}{4}$, and $\frac{3}{6}$ are equal.

23. Show that $\frac{1}{2}$ of a foot, $\frac{2}{4}$ of a foot, and $\frac{3}{6}$ of a foot give the same number of inches.

24. Show that $\frac{4}{6}$ of 18 and $\frac{6}{9}$ of 18 are the same as $\frac{2}{3}$ of 18.

25. One half equals how many fourths? how many eighths? $\frac{1}{2}=\frac{?}{4}$ $\frac{1}{2}=\frac{?}{8}$

26. $\frac{1}{4}=\frac{?}{8}$ $\frac{2}{4}=\frac{?}{8}$ $\frac{3}{4}=\frac{?}{8}$ $\frac{1}{4}=\frac{?}{16}$ $\frac{3}{4}=\frac{?}{16}$

27. $\frac{1}{3}=\frac{?}{6}$ $\frac{2}{3}=\frac{?}{6}$ $\frac{1}{3}=\frac{?}{9}$ $\frac{2}{3}=\frac{?}{9}$ $\frac{3}{3}=\frac{?}{9}$

28. $\frac{1}{5}=\frac{?}{10}$ $\frac{2}{5}=\frac{?}{10}$ $\frac{3}{5}=\frac{?}{10}$ $\frac{4}{5}=\frac{?}{10}$ $\frac{5}{5}=\frac{?}{10}$

29. $\frac{1}{6}=\frac{?}{12}$ $\frac{2}{6}=\frac{?}{12}$ $\frac{3}{6}=\frac{?}{12}$ $\frac{4}{6}=\frac{?}{12}$ $\frac{5}{6}=\frac{?}{12}$

30. Add $\frac{1}{2}$ and $\frac{5}{8}$.

$\frac{1}{2}=\frac{4}{8}$
$\frac{5}{8}=\frac{5}{8}$
$\frac{9}{8}=1\frac{1}{8}$

In example 30, change $\frac{1}{2}$ to $\frac{4}{8}$. The sum of $\frac{4}{8}$ and $\frac{5}{8}$ is $\frac{9}{8}$, or $1\frac{1}{8}$.

31. Add $3\frac{1}{2}$ and $1\frac{5}{8}$.

$3\frac{1}{2}=3\frac{4}{8}$
$1\frac{5}{8}=1\frac{5}{8}$
$5\frac{1}{8}$

In example 31, first add the fractions, then the whole numbers. $\frac{9}{8}=1\frac{1}{8}$. Write $\frac{1}{8}$; carry 1. $1+1+3=5$. The sum is $5\frac{1}{8}$.

32. From $\frac{1}{2}$ take $\frac{3}{8}$.

$\frac{1}{2}=\frac{4}{8}$
$\frac{3}{8}=\frac{3}{8}$
$\frac{1}{8}$

In example 32, change $\frac{1}{2}$ to $\frac{4}{8}$. $\frac{4}{8}-\frac{3}{8}=\frac{1}{8}$.

33. From $5\frac{1}{2}$ take $3\frac{5}{8}$.

$5\frac{1}{2}=5\frac{4}{8}$
$3\frac{5}{8}=3\frac{5}{8}$
$1\frac{7}{8}$

In example 33, change $\frac{1}{2}$ to $\frac{4}{8}$. As $\frac{5}{8}$ cannot be taken from $\frac{4}{8}$, change 1 of the 5 units to $\frac{8}{8}$; $\frac{8}{8}+\frac{4}{8}=\frac{12}{8}$; $\frac{12}{8}-\frac{5}{8}=\frac{7}{8}$; 3 from 4 = 1. The remainder is $1\frac{7}{8}$.

Find the answers:

	a	*b*	*c*	*d*	*e*
34.	$\frac{1}{2}+\frac{1}{4}$	$\frac{1}{2}+\frac{1}{8}$	$\frac{1}{2}+\frac{3}{8}$	$\frac{1}{2}-\frac{1}{4}$	$\frac{1}{2}-\frac{3}{8}$
35.	$\frac{1}{3}+\frac{1}{6}$	$\frac{1}{3}+\frac{2}{6}$	$\frac{1}{3}+\frac{3}{6}$	$\frac{1}{3}-\frac{1}{6}$	$\frac{1}{3}-\frac{2}{6}$
36.	$\frac{1}{3}+\frac{1}{9}$	$\frac{1}{3}+\frac{2}{9}$	$\frac{1}{3}+\frac{3}{9}$	$\frac{1}{3}-\frac{2}{9}$	$\frac{1}{3}-\frac{1}{9}$

First add; then subtract:

37.	$3\frac{1}{2}$	$4\frac{1}{3}$	$3\frac{1}{3}$	$5\frac{1}{5}$	$6\frac{1}{6}$
	$2\frac{1}{4}$	$3\frac{1}{6}$	$1\frac{1}{9}$	$4\frac{1}{10}$	$4\frac{1}{12}$
38.	$5\frac{1}{2}$	$4\frac{4}{6}$	$5\frac{5}{6}$	$4\frac{7}{10}$	$5\frac{5}{12}$
	$4\frac{1}{8}$	$1\frac{1}{2}$	$2\frac{1}{3}$	$3\frac{1}{5}$	$3\frac{1}{6}$

39. Give multiples of:

2, 5	4, 8	2, 4	2, 3	5, 10
4, 6	8, 16	2, 6	3, 4	2, 10
2, 8	3, 5	3, 6	3, 9	2, 3, 4
2, 4, 8	2, 4, 16	3, 4, 12	2, 8, 16	2, 3, 6

Thus, 10 is a multiple of 2 and 5; 8 of 4 and 8; 12 of 2, 3, and 4; 8 of 2, 4, and 8.

To THE TEACHER. Continue this drill if necessary.

Before fractions can be added or subtracted they must have the same denominator.

Learn:

$\frac{1}{2} = \frac{2}{4} = \frac{3}{6} = \frac{4}{8} = \frac{5}{10} = \frac{6}{12} = \frac{8}{16}$.
$\frac{1}{3} = \frac{2}{6} = \frac{3}{9} = \frac{4}{12} = \frac{5}{15}$; $\frac{2}{3} = \frac{4}{6} = \frac{6}{9} = \frac{8}{12} = \frac{10}{15}$.
$\frac{1}{4} = \frac{2}{8} = \frac{3}{12} = \frac{4}{16}$; $\frac{3}{4} = \frac{6}{8} = \frac{9}{12} = \frac{12}{16}$.
$\frac{1}{5} = \frac{2}{10} = \frac{3}{15}$; $\frac{2}{5} = \frac{4}{10} = \frac{6}{15}$; $\frac{3}{5} = \frac{6}{10} = \frac{9}{15}$.
$\frac{1}{6} = \frac{2}{12}$; $\frac{5}{6} = \frac{10}{12}$; $\frac{1}{8} = \frac{2}{16}$; $\frac{3}{8} = \frac{6}{16}$; $\frac{5}{8} = \frac{10}{16}$; $\frac{7}{8} = \frac{14}{16}$.

WRITTEN

First add; then subtract. (Consult the above table, if necessary.)

	a	*b*	*c*	*d*	*e*	*f*	*g*	*h*	*i*	*j*
1.	$\frac{1}{2}$	$\frac{1}{3}$	$\frac{1}{3}$	$\frac{1}{5}$	$\frac{1}{2}$	$\frac{2}{3}$	$\frac{1}{3}$	$\frac{3}{4}$	$\frac{2}{3}$	$\frac{2}{5}$
	$\frac{1}{5}$	$\frac{1}{4}$	$\frac{1}{5}$	$\frac{1}{10}$	$\frac{2}{5}$	$\frac{1}{4}$	$\frac{1}{6}$	$\frac{1}{3}$	$\frac{2}{5}$	$\frac{1}{10}$

Add:

	a	*b*	*c*	*d*	*e*	*f*
2.	$2\frac{1}{3}$	$4\frac{3}{4}$	$7\frac{1}{8}$	$6\frac{1}{2}$	$3\frac{3}{4}$	$8\frac{1}{2}$
	$1\frac{1}{5}$	$3\frac{1}{3}$	$4\frac{1}{4}$	$2\frac{1}{6}$	$2\frac{1}{6}$	$5\frac{3}{5}$

3. Subtract:

$8\frac{1}{2}$	$5\frac{5}{8}$	$4\frac{1}{3}$	$5\frac{5}{6}$	$9\frac{1}{2}$	$7\frac{5}{6}$
$4\frac{1}{3}$	$3\frac{1}{4}$	$2\frac{1}{4}$	$4\frac{1}{2}$	$2\frac{3}{10}$	$4\frac{1}{3}$

4. Add:

$3\frac{1}{2}$	$5\frac{1}{3}$	$2\frac{1}{2}$	$4\frac{1}{3}$	$7\frac{1}{5}$	$6\frac{1}{2}$
$2\frac{1}{4}$	$6\frac{1}{2}$	$1\frac{1}{3}$	$5\frac{1}{4}$	$2\frac{1}{10}$	$3\frac{1}{4}$
$4\frac{1}{8}$	$7\frac{1}{6}$	$8\frac{1}{4}$	$9\frac{1}{3}$	$4\frac{3}{10}$	$5\frac{1}{16}$

Add:

	a	*b*	*c*	*d*	*e*	*f*
5.	$15\frac{1}{2}$	$20\frac{1}{2}$	$35\frac{1}{2}$	$44\frac{1}{2}$	$62\frac{1}{2}$	$78\frac{1}{5}$
	$25\frac{1}{3}$	$5\frac{1}{4}$	$94\frac{1}{3}$	$63\frac{2}{3}$	$52\frac{1}{3}$	$44\frac{1}{10}$
	$19\frac{1}{6}$	$14\frac{1}{8}$	$59\frac{1}{4}$	$44\frac{1}{4}$	$39\frac{3}{4}$	$25\frac{1}{10}$
6.	$18\frac{1}{3}$	$30\frac{1}{3}$	$48\frac{1}{2}$	$75\frac{1}{2}$	$67\frac{1}{3}$	$86\frac{1}{3}$
	$16\frac{1}{6}$	15	$76\frac{1}{8}$	$86\frac{1}{3}$	$38\frac{1}{4}$	$77\frac{1}{9}$
	$14\frac{2}{3}$	$6\frac{5}{6}$	$17\frac{1}{16}$	$97\frac{1}{6}$	$59\frac{1}{4}$	$58\frac{2}{9}$
7.	$13\frac{1}{5}$	$40\frac{1}{3}$	$33\frac{2}{3}$	$48\frac{1}{2}$	$25\frac{1}{2}$	$62\frac{1}{3}$
	$12\frac{1}{5}$	$17\frac{1}{4}$	$24\frac{3}{4}$	$19\frac{3}{4}$	$44\frac{1}{10}$	$39\frac{1}{9}$
	$20\frac{3}{10}$	$8\frac{1}{2}$	$85\frac{1}{3}$	$22\frac{1}{8}$	$56\frac{1}{10}$	$93\frac{2}{9}$

Subtract:

8.	$83\frac{1}{2}$	$92\frac{1}{2}$	$81\frac{3}{4}$	$74\frac{1}{3}$	$63\frac{1}{3}$	$59\frac{2}{3}$
	$72\frac{1}{8}$	$66\frac{1}{4}$	$35\frac{1}{2}$	$45\frac{1}{4}$	$54\frac{1}{6}$	$34\frac{1}{4}$
9.	$65\frac{2}{3}$	$83\frac{2}{3}$	$58\frac{3}{8}$	$28\frac{5}{16}$	$84\frac{5}{6}$	$93\frac{1}{5}$
	$49\frac{1}{6}$	$57\frac{1}{2}$	$44\frac{1}{4}$	$16\frac{1}{8}$	$75\frac{1}{3}$	$85\frac{1}{10}$
10.	84	74	47	48	95	82
	$57\frac{1}{8}$	$48\frac{2}{3}$	$33\frac{3}{4}$	$37\frac{1}{2}$	$69\frac{4}{5}$	$46\frac{5}{6}$

Solution to Ex. 10*a*. Change 1 unit to $\frac{8}{8}$; $\frac{8}{8} - \frac{1}{8} = \frac{7}{8}$; $83 - 57 = 26$. Ans. $26\frac{7}{8}$.

PROBLEMS

1. If I cut $\frac{1}{2}$ a yard of lawn from a piece $\frac{3}{4}$ yard long, how much is left?

2. A towel is to be 24 inches long when finished. If $\frac{3}{4}$ of an inch is allowed at each end for the hem, how long must the towel be cut?

3. If a boy saws off $1\frac{1}{3}$ feet from a board $3\frac{2}{3}$ feet long, how long is the part that is left?

4. How much tape is needed to bind the edge of a holder $5\frac{1}{2}$ inches long and 4 inches wide, if $\frac{1}{2}$ inch is allowed on each corner for turning?

5. Frank sold newspapers for $1\frac{1}{3}$ hours on Monday and $2\frac{5}{6}$ hours on Tuesday. How many hours did he work both days?

6. Mabel bought 5 yards of ribbon and used $3\frac{3}{4}$ yards for a hat bow. How much had she left?

7. A flower bed is $4\frac{3}{4}$ feet long and $3\frac{1}{2}$ feet wide. How much greater is the length than the width?

8. If you have $\frac{7}{8}$ of a yard of cloth in one piece and $\frac{5}{8}$ of a yard in another piece, how much cloth have you?

9. From $15\frac{2}{3}$ yards of cord, I cut off for a kite string all but $2\frac{1}{3}$ yards. How much did I cut off?

10. How much scrim must I use for a window curtain 6 feet long, allowing $2\frac{1}{4}$ inches at the top for finishing and $1\frac{1}{2}$ inches at the bottom for a hem?

11. A ruffle with two $\frac{1}{2}$ in. tucks and a $1\frac{1}{4}$ in. hem is 6 in. deep. From how long a piece of lawn was it made?

12. An envelope is $5\frac{1}{2}$ inches long and $2\frac{1}{2}$ inches wide. What is its perimeter?

13. A blotter is $9\frac{3}{4}$ inches long and $4\frac{1}{4}$ inches wide. How much greater is the length than the width?

14. I spend $\$1\frac{3}{4}$ for meat and $\$\frac{1}{2}$ for groceries. How much more do I spend for meat than for groceries?

15. A sheet for a doll's bed is $9\frac{7}{8}$ inches long and $6\frac{3}{8}$ inches wide. How much greater is the length than the width?

16. What is the combined length of two sticks, one of which is $2\frac{1}{3}$ feet long and the other $1\frac{1}{3}$ feet long?

17. Frank walks $1\frac{1}{10}$ hours and John $5\frac{3}{10}$ hours. How much longer does John walk than Frank?

18. There are $3\frac{5}{12}$ dozen buttons on one card and $2\frac{4}{12}$ dozen on another card. How many dozen are there on both cards?

19. If I cut $1\frac{1}{2}$ yards of ribbon from a piece containing $10\frac{1}{2}$ yards, how many yards remain?

20. What is the distance around a rug that is $4\frac{1}{4}$ feet long and $3\frac{3}{8}$ feet wide?

21. If you have $\$5\frac{3}{10}$ and spend $\$1\frac{2}{10}$, how much have you left?

22. If I buy 2 pounds of butter and use $1\frac{3}{4}$ pounds, how much have I left?

23. I have $\$\frac{2}{5}$ and spend $\$\frac{1}{5}$. How much have I left?

24. A line $7\frac{5}{6}$ inches long is how much longer than a line $3\frac{1}{12}$ inches long?

25. If 6 yards of cloth cost 48¢, how much does one yard cost?

26. If 6 yards of cloth cost 48¢, what part of 48¢ do 2 yards cost? How do you find this part of 48¢?

27. If 6 yards of cloth cost 48¢, how much do 3 yards cost? 3 yards is what part of 6 yards? The cost of 3 yards is what part of the cost of 6 yards?

28. In an orchard there are 12 apple trees. One apple tree is what fractional unit of the whole number?

29. If there are 3 rows of trees in an orchard with 4 in each row, what part of the whole number is there in one row? in 2 rows?

30. If there are 4 rows of trees with 3 trees in a row, each row contains what part of the whole number of trees? $\frac{1}{4}$ of 12 trees equals how many? $\frac{2}{4}$ of 12 trees equal how many?

31. What other fraction of 12 trees equals $\frac{2}{4}$ of 12 trees? What other fraction equals $\frac{2}{4}$ of any number?

32. How many inches are there in $\frac{3}{4}$ of a yard? in $\frac{5}{6}$ of a yard? in $\frac{1}{2}$ of a yard?

33. If one yard of lace costs 32¢, what is the cost of $\frac{3}{4}$ of a yard?

34. How much ribbon will be needed on a sewing apron for two ties, each $\frac{3}{4}$ yard long, and two bows, each requiring $\frac{1}{2}$ yard?

35. Arthur spends \$ $3\frac{1}{5}$ and Ruth \$ $2\frac{1}{10}$. How much more does Arthur spend than Ruth? How much do both together spend?

36. How do you find $\frac{3}{4}$ of a number?

37. 9 trees are how many twelfths of 12 trees?

38. $\frac{3}{4}$ of 12 trees = how many twelfths of 12 trees?

39. $\frac{3}{4}$ of 12 equals how many twelfths of 12?

40. $\frac{3}{4}$ of any number equals how many twelfths of that number?

41. $\frac{4}{3} = 4 \div 3 = 1\frac{1}{3}$. $1\frac{1}{3}$ are what part of 4?

42. If 4 melons are divided equally among James, John, and Henry, how shall you find each one's share?

43. If you wish to give John his share before any of the others receive any, how can you find out what he is to have?

44. If 4 yards of ribbon are divided among three girls, what is the length of each piece?

45. In dividing the melons (example 42), each boy will have one whole melon and $\frac{1}{3}$ of the remaining melon; but in dividing the ribbon (example 44), each girl's share is to be in one piece. How can you find the length that shall be cut off the whole piece for each girl?

46. If any number of things is to be divided among 3 people, how can you find the number each one is to have? Give example.

47. Which is more, \$$\frac{3}{4}$ or \$$\frac{1}{2}$? \$$\frac{1}{2}$ or \$$\frac{4}{10}$?

48. If you spend \$$\frac{3}{10}$ out of a dollar, what part of a dollar have you left?

49. If you spend \$$\frac{3}{10}$ for lawn and \$$\frac{5}{10}$ for lace, how much change should you get from \$1?

MULTIPLYING BY MIXED NUMBERS

STUDY RECITATION

1. Multiply 14 by $3\frac{1}{2}$.

$$\begin{array}{r} 14 \\ \underline{3\frac{1}{2}} \\ 7 \\ 42 \\ \hline 49 \end{array}$$

$3\frac{1}{2} \times 14$ means $\frac{1}{2}$ of 14 plus 3×14.
$\frac{1}{2}$ of $14 = 7$. $3 \times 14 = 42$.
$7 + 42 = 49$.

2. Multiply 24 by $3\frac{3}{4}$.

$$\begin{array}{r} 24 \\ \underline{3\frac{3}{4}} \\ 18 \\ 72 \\ \hline 90 \end{array}$$

$\frac{1}{4}$ of $24 = 6$. $\frac{3}{4}$ of $24 = 18$. $3 \times 24 = 72$.
$18 + 72 = 90$.

A number like $3\frac{1}{2}$ and $3\frac{3}{4}$, consisting of a whole number and a fraction, is called a **mixed number.**

The sign @, followed by a price, means at so much a unit. Thus, 3 dozen buttons @ 10¢ means 3 dozen buttons at 10 cents a dozen. Ten cents may be written either 10¢ or $.10.

WRITTEN

Find the cost of each of the following:

3. $2\frac{1}{2}$ yards of ribbon @ 20¢; @ 40¢; @ 24¢.
4. $6\frac{1}{4}$ pounds of steak @ 32¢; @ 36¢; @ 28¢.
5. $4\frac{1}{2}$ quarts of milk @ 10¢; @ 8¢; @ 6¢.
6. $1\frac{1}{3}$ dozen eggplants @ 75¢; @ 60¢; @ 48¢.
7. $1\frac{1}{2}$ barrels of flour @ $5.40; @ $4.80; @ $5.20.
8. $6\frac{7}{8}$ yards of cloth @ $2.40; @ $4.00; @ 96¢.

GENERAL REVIEW

Oral

1. Add first 5, then 4, then 6, then 7, then 8, then 9, to: 3, 4, 6, 2, 5, 7, 8, 9, 12, 11, 10, 15.

2. Subtract first 1, then 2, then 6, then 8, then 3, then 4, then 7, then 5, then 9 from each of the following numbers: 27, 30, 46, 51, 62, 74, 83, 98, 45, 49.

Multiply rapidly:

	a	*b*	*c*	*d*
3.	9×7	10×10	5×12	8×9
4.	8×6	11×11	8×10	8×12
5.	6×9	9×9	11×5	9×12
6.	7×8	8×8	7×4	10×11
7.	10×9	11×9	6×7	5×9
8.	12×12	6×6	12×7	10×12
9.	8×11	12×6	7×7	12×11

Divide rapidly:			Find:
10. $32 \div 4$	$64 \div 8$	$27 \div 9$	$\frac{1}{5}$ of 45
11. $35 \div 7$	$66 \div 11$	$44 \div 11$	$\frac{1}{9}$ of 54
12. $36 \div 6$	$63 \div 9$	$45 \div 9$	$\frac{1}{8}$ of 48
13. $36 \div 9$	$77 \div 11$	$54 \div 9$	$\frac{1}{6}$ of 24
14. $40 \div 8$	$80 \div 10$	$56 \div 8$	$\frac{1}{7}$ of 35
15. $42 \div 7$	$81 \div 9$	$72 \div 9$	$\frac{3}{4}$ of 16
16. $48 \div 6$	$84 \div 12$	$72 \div 8$	$\frac{7}{8}$ of 24
17. $50 \div 10$	$90 \div 10$	$84 \div 7$	$\frac{2}{3}$ of 18

READING AND WRITING NUMBERS

Read the following numbers:

	a	*b*	*c*	*d*
1.	1546	84,275	215,620	1,520,000
2.	2729	16,421	300,400	3,000,050
3.	1835	43,050	643,007	7,050,000
4.	2000	40,507	705,206	8,500,500
5.	5065	90,005	315,500	9,600,000
6.	6002	50,308	701,020	5,000,609

Read the following numbers:

	a	*b*	*c*
7.	$653.25	$200,000.00	$15,630.25
8.	$200.09	$467,535.25	$145,720.40
9.	$705.03	$19,108.05	$19,560.28
10.	$5006.07	$708,009.10	$4320.04
11.	$20,201.08	$500,000.50	$17,516.08

Write:

12. Two hundred fifty thousand six.
13. Five hundred eighty-eight thousand nine.
14. Five million five thousand.
15. Fifty-six thousand four.
16. Two hundred five dollars and nine cents.
17. Three thousand dollars and seventy-five cents.
18. Seventy-five cents.
19. Five hundred ten dollars and ninety cents.

ADDITION

Add rapidly upwards and prove by adding downwards. Time your work.

	a	*b*	*c*	*d*
1.	5705	18,009	14,003	160,523
	6894	20,953	72,304	540,321
	7123	30,412	81,009	750,000
	8472	87,654	91,543	640,009
	9891	21,052	61,211	330,002
2.	$521.25	$630.18	$876.54	$712.00
	642.75	540.19	321.07	803.04
	314.84	780.16	987.65	900.09
	220.96	504.00	432.12	580.70
	540.72	305.02	345.61	602.04
3.	$9075.42	$9561.25	$4031.25	$10,024.38
	8031.31	9050.20	300.45	13,050.00
	5678.99	8760.50	20.79	20,942.79
	9213.87	5040.00	506.82	1,838.95
	7400.65	3097.62	807.76	1,762.62
4.	$2056.78	$5021 29	$7056.87	$80,007.28
	9545.07	3456.78	6567.89	19,816.38
	5634.16	2123.89	5456.78	28,725.49
	4723.25	2745.67	4343.21	37,634.57
	3812.34	3478.96	3200.32	46,543.62
	6437.82	9108.04	5603.57	89,253.01

SUBTRACTION

Subtract rapidly and prove. Time your work.

	a	*b*	*c*	*d*	*e*	*f*
1.	9876	4129	6304	5058	7107	8204
	4987	3350	5159	4609	2998	3498
2.	4560	5004	7008	6050	8010	6050
	3025	2346	3497	4888	6999	5674
3.	5035	5050	7080	9900	8705	7603
	4609	4384	6909	7537	6409	2345
4.	3000	4000	5000	6000	7000	8000
	2547	3346	4978	5987	2789	6987

	a	*b*	*c*	*d*	*e*
5.	$950.48	$875.25	$742.81	$630.52	$820.98
	789.00	654.89	437.82	345.67	210.82
6.	$600.00	$700.00	$800.00	$900.00	$500.00
	401.03	108.02	205.09	305.04	409.05
7.	$500.03	$865.07	$508.02	$400.65	$300.25
	308.05	508.09	299.97	399.99	288.88
8.	$987.60	$905.00	$850.43	$700.05	$654.08
	777.77	666.66	555.55	444.44	333.33
9.	$800.50	$706.50	$790.05	$643.21	$400.08
	567.89	654 32	609.87	598.32	398.59

MISCELLANEOUS WORK

1. Begin with 4, and count by 4's to 100.
2. Begin with 5, and count by 5's to 100.
3. Begin with 6, and count by 6's to 102.
4. Begin with 7, and count by 7's to 105.
5. Begin with 8, and count by 8's to 104.
6. Begin with 9, and count by 9's to 108.
7. Begin with 10, and count by 10's to 100.
8. Begin with 11, and count by 11's to 122.
9. Begin with 12, and count by 12's to 144.
10. $\$26.15 + \$18.05 + \$9.65 + \$27.84 - \$19.09 = ?$
11. $\$5.07 + \$.27 + \$.06 + \$7.09 - \$10.10 = ?$
12. $285 + 136 - 217 + 654 - 231 + 472 - 354 = ?$
13. $750 - 203 + 165 - 243 + 148 - 27 + 95 = ?$
14. Find the sum of 18×256 and 27×395.
15. Find the sum of 24×874 and 32×483.
16. Find the sum of 96×134 and 87×256.
17. Find the difference between 19×64 and 27×38.
18. Find the difference between 23×86 and 94×15.
19. Find the difference between 24×96 and $96 \div 24$.
20. Add 14×161 and 161×14.
21. $\$27.35 + \$18.95 + \$43.50 - \$15.65 - \$14.25 = ?$
22. $\$56.84 + \$19.75 - \$10.40 - \$12.72 + \$18.19 = ?$
23. $325 + 446 + 517 - 1000 + 5628 - 2599 = ?$
24. $987 + 1065 + 1213 + 666 - 2954 + 3005 = ?$

MULTIPLICATION

Multiply rapidly. Time your work.

	a	*b*	*c*	*d*	*e*	*f*
1.	316	229	836	725	516	432
	495	415	157	198	424	318
2.	789	328	569	429	876	976
	403	305	608	709	806	254
3.	451	649	556	428	734	621
	300	500	610	510	420	410
4.	1045	2564	1456	8705	9008	7503
	987	654	874	339	509	605
5.	6082	7057	8320	5420	6785	8219
	1234	8765	9104	8015	2584	3567

	a	*b*	*c*	*d*	*e*
6.	$600.54	$543.29	$875.87	$494.25	$357.88
	504	300	643	549	456
7.	$525.45	$742.50	$349.95	$817.89	$423.94
	875	456	349	786	529
8.	$641.92	$985.09	$457.50	$965.04	$700.05
	432	658	987	629	999
9.	$875.84	$876.99	$498.95	$987.62	$815.67
	679	548	648	749	548

UNITED STATES MONEY

Find the cost of:

1. 8 yards of cambric @ $.25.
2. 2 dozen buttons @ $.19.
3. 5 yards of braid @ $.11.
4. 6 yards of linen @ $.50.
5. 3 packages of needles @ $.05.
6. 2 boys' handkerchiefs @ $.15.
7. 5 yards of crepe @ $.40.
8. 4 yards of lace @ $.08.
9. 7 neckties @ $.18.
10. 5 yards of velvet @ $1.75.
11. 3 Crex rugs @ $4.25.
12. 2 pairs of net curtains @ $2.75.
13. 3 pairs of pillow cases @ $.65.
14. 3 bedspreads @ $2.39.
15. 3 pairs of cuffs @ $.13.
16. 2 pairs of shoes @ $3.50.
17. 3 pairs of hose @ $.35.
18. 5 pairs of gloves @ $.95.
19. 7 yards of percale @ $.14.
20. 2 boys' overcoats @ $10.75.

21–24. Add the products in examples 1 to 5; in examples 6 to 10; in examples 11 to 15; in examples 16 to 20.

DIVISION

Find quotients and prove. Time your work.

	a	*b*	*c*
1.	19,362 ÷ 42	85,914 ÷ 86	80,812 ÷ 89
2.	55,756 ÷ 53	83,711 ÷ 97	36,381 ÷ 67
3.	78,516 ÷ 54	50,248 ÷ 88	55,550 ÷ 50
4.	54,229 ÷ 61	70,092 ÷ 99	45,120 ÷ 60
5.	62,025 ÷ 75	85,434 ÷ 87	30,170 ÷ 70
6.	54,611 ÷ 97	72,090 ÷ 45	19,955 ÷ 65

	a	*b*
7.	643,050 ÷ 450	741,963 ÷ 109
8.	983,665 ÷ 565	827,820 ÷ 210
9.	642,600 ÷ 675	934,570 ÷ 338
10.	540,176 ÷ 784	646,272 ÷ 459
11.	829,990 ÷ 994	456,135 ÷ 647
12.	567,378 ÷ 553	366,418 ÷ 829
13.	$ 725.84 ÷ 344	$ 3240.72 ÷ 504
14.	$ 3390.66 ÷ 546	$ 3479.48 ÷ 148
15.	$ 5073.27 ÷ 789	$ 9264.15 ÷ 153
16.	$ 5089.05 ÷ 645	$ 34,396.56 ÷ 344
17.	$ 3240.72 ÷ 643	$ 44,991.36 ÷ 642

Give quotients at sight:

18.	200 ÷ 10	360 ÷ 120	$ 36.00 ÷ 120	$ 48.00 ÷ 120
19.	200 ÷ 40	480 ÷ 160	$ 54.00 ÷ 180	$ 60.00 ÷ 500
20.	500 ÷ 50	720 ÷ 180	$ 72.00 ÷ 900	$ 200.00 ÷ 400

DENOMINATE NUMBERS

1. How many ounces are there in 1 pound? in $1\frac{1}{2}$ pounds? in $2\frac{1}{2}$ pounds?

2. How many inches are there in 1 foot? in 3 feet? in $2\frac{3}{4}$ feet? in 1 yard? in $1\frac{1}{2}$ yards? in $3\frac{1}{4}$ yards?

3. How many feet are there in 1 yard? in 3 yards? in $2\frac{2}{3}$ yards?

4. There are **$16\frac{1}{2}$ feet in a rod.** How many feet are there in 2 rods? in 4 rods?

5. There are **320 rods in a mile.** How many rods are there in 6 miles? in 10 miles?

6. There are **5280 feet in a mile.** How many feet are there in 5 miles? in 12 miles?

7. How many pints are there in $2\frac{1}{2}$ quarts?

8. How many quarts are there in $3\frac{1}{4}$ gallons?

9. How many quarts are there in $2\frac{1}{4}$ pecks?

10. How many pecks are there in $3\frac{1}{2}$ bushels?

11. How many things are there in $2\frac{1}{3}$ dozen?

12. How many days are there in 1 week? in 15 weeks?

13. How many months are there in 1 year? in 5 years?

14. 32 ounces = how many pounds?

15. 36 inches = how many feet? how many yards?

16. 12 feet = how many yards?

17. 16 pecks = how many quarts?

18. 16 gallons = how many quarts?

19. 48 = how many dozen?

20. 35 weeks = how many days?

21. 24 months = how many years?

22. Find the cost of $1\frac{1}{2}$ quarts of milk at \$.10 a quart.

23. How many buttons are there in $12\frac{3}{4}$ dozen?

24. Find the cost of $1\frac{3}{4}$ pounds of butter at \$.36 a pound.

25. If you take 1 quart of milk from a gallon of milk, how many quarts will be left?

26. How many square inches are there in 5 square feet?

27. How many square feet equal 432 square inches?

28. How many square feet equal 18 square yards?

29. How many square yards equal 180 square feet?

30. How many square yards equal 4 square rods?

31. How many square rods are there in 15 acres?

32. How many acres equal 320 square rods?

33. At 14¢ a square foot how much will it cost to cement the floor of a cellar 28 ft. long by 20 ft. wide?

34. How many square inches are there in a window pane that is 26 inches long and 21 inches wide?

35. At 18¢ per square yard, how much will it cost to paint the ceiling of a room that is 18 ft. square?

36. Which has the greater area, a room 18 ft. long and 12 ft. wide, or a room 16 ft. square?

37. Draw a diagram on a scale of 1 inch to 1 foot to represent a door $3\frac{1}{2}$ ft. wide and 8 ft. high. What is the area of this door?

MULTIPLYING BY MIXED NUMBERS

Find the cost of:

1. $1\frac{3}{4}$ pounds of grapes @ \$.24.
2. $2\frac{1}{12}$ dozen eggs @ \$.36.
3. $5\frac{3}{8}$ yards of ribbon @ \$.32.
4. $9\frac{3}{4}$ yards of cambric @ \$.28.
5. $2\frac{1}{2}$ gallons of milk @ \$.40.
6. $15\frac{1}{2}$ pounds of raisins @ \$.12.
7. $2\frac{1}{2}$ tons of hay @ \$12.
8. $3\frac{1}{2}$ pounds of sugar @ \$.06.
9. $2\frac{3}{4}$ pounds of steak @ \$.24.
10. $5\frac{1}{2}$ yards of silk @ \$1.50.
11. $9\frac{1}{2}$ bushels of pears @ \$1.60.
12. $3\frac{3}{4}$ pounds of butter @ \$.36.
13. $5\frac{1}{2}$ bushels of sweet potatoes @ \$.80.
14. $10\frac{1}{2}$ pounds of tea @ \$.56.
15. $5\frac{7}{8}$ yards of cloth @ \$.64.
16. $5\frac{3}{4}$ tons of hay @ \$16.
17. $2\frac{3}{4}$ yards of madras @ \$.28.
18. $1\frac{1}{2}$ yards of linen @ \$.36.
19. $3\frac{3}{4}$ pounds of grapes @ \$.28.
20. $2\frac{5}{8}$ yards of taffeta @ \$.80.
21. $5\frac{3}{4}$ dozen buttons @ \$.20.
22. $2\frac{3}{10}$ hours' work @ \$.50.
23. $2\frac{3}{4}$ pounds of chickens @ \$.36.

MAKING CHANGE

Make change from \$.25 for each of the following purchases at the dry goods store:

1. 2 yards of ribbon at \$.08 a yard.
2. $3\frac{1}{2}$ dozen buttons at \$.06 a dozen.
3. 2 cakes of soap for \$.05.
4. 6 packages of hairpins at 3 for \$.05.
5. $\frac{1}{4}$ yard of lawn at \$.24 a yard.
6. $1\frac{1}{2}$ yards of lace at \$.16 a yard.

Make change from \$.50 for each of the following purchases at a restaurant:

7. 2 cups of coffee at \$.05 a cup.
8. 3 orders of toast at \$.10 each.
9. 2 plates of wheat cakes at \$.10 each.
10. 1 steak at \$.35.
11. 1 portion of potatoes at \$.10.

Make change from \$1 for the following purchases at the grocery store:

12. 1 bushel of potatoes at \$.75 a bushel.
13. $2\frac{1}{2}$ pounds of butter at \$.32 a pound.
14. 1 dozen eggplants at \$.70 a dozen.
15. $\frac{1}{2}$ dozen watercress at \$.30 a dozen.
16. $\frac{1}{2}$ dozen lemons at \$.24 a dozen.
17. Make change from \$5 for the purchases in examples 12 to 16.

PROBLEMS

1. If a 10-pound sack of rolled oats costs 30¢, what is the price per pound?

2. If corn is planted at the rate of 7 quarts per acre, how much will be needed to plant 25 acres?

3. If a grocer pays $75 for 25 crates of strawberries, how much will 50 crates cost him?

4. If 2 tablespoonfuls of butter make an ounce, how many tablespoonfuls of butter are there in a pound?

5. Find the cost of 40 boxes of grapefruits at $3 a box.

6. Find, in the shortest way, the cost of 12 apples sold at 3 for 10¢; at 2 for 5¢.

7. How many cards, of a dozen buttons each, must a teacher buy to provide a class of 12 girls with 8 buttons each?

8. At 12¢ a yard, find the cost of trimming Ethel's sleeves and collar with lace, if it requires 10 inches for each sleeve and 25 inches for the collar.

9. There are 6 tablespoonfuls of sugar in 1 ounce. If each girl in a cooking class of 20 girls used 3 tablespoonfuls, how many ounces were used by the class?

10. If $\frac{1}{4}$ pound of butter is cut into 8 equal pieces, how many such pieces will a pound of butter make?

11. Mabel was earning money by selling aprons. If she used for each apron $2\frac{1}{3}$ yards of gingham at 9¢ a yard, how much did she earn on 18 aprons sold at 30¢ each?

12. A roller towel measures 26 inches when doubled. How many yards of crash must be allowed if 1 inch is used in making the seam?

13. A class of 8 girls used 2 yards of cloth at 16 cents a yard. How much cloth did each girl use? What was the cost of the lesson per pupil?

14. A recipe for a pudding for 6 people calls for 1 pint of milk, 2 eggs, $\frac{1}{4}$ cup of sugar, $\frac{1}{4}$ teaspoonful of salt, and 1 teaspoonful of flavoring. How much of each would be needed for 12 people? for 3 people?

15. How long a tablecloth can be made from $2\frac{1}{2}$ yards of damask, allowing 4 inches for waste and 1 inch for a hem at each end?

16. There are 30 girls in a class in cooking. If each girl uses an orange and 2 eggs, how many dozen will the class need?

17. If a boy can paste 720 samples in an 8-hour day, how many can he paste in an hour? in a week of 6 days?

18. How much braid must be bought to trim the outer edge of a table cover 26 inches long and 26 inches wide, allowing 1 inch at each corner for turning?

19. Find the cost of supplying a class of 15 boys with drafting boards at 35¢ each.

20. There are 25 needles in a package. How many packages are needed for 2 classes of 15 girls each, if each girl is allowed 5 needles?

21. A man shipped 4 carloads of wheat. The cars contained the following number of pounds: 31,800 lb., 42,450 lb., 36,800 lb., and 52,480 lb. How many pounds of wheat did he ship?

22. How many more pounds did he ship in the fourth car than in the first? than in the second? the third?

23. A bushel of wheat weighs 60 pounds. How many bushels did he ship in each car?

24. If one fourth of a farm of 320 acres is used for pasture, and the rest for corn, wheat, and oats, how many acres are there in corn, wheat, and oats?

25. In three months a man earns $127.50. The first month he earns $40.75; the last month he earns $51.50. How much does he earn the second month?

26. Find the cost of a corset cover requiring $1\frac{1}{4}$ yards of cambric @ $.16, $2\frac{1}{4}$ yards of lace @ $.12, $\frac{1}{4}$ dozen buttons @ $.12, and 1 spool of thread @ $.05.

27. Find the cost of a dress for which you use 5 yards of cloth @ $.85, buttons for $.05, and thread for $.05.

28. A flock of 50 hens averages 96 eggs each. If the eggs sell at $.22 per dozen, find their total value.

29. How much will it cost to furnish a class of 12 girls with $1\frac{3}{4}$ yards of cloth each, at 24¢ a yard?

30. If one yard of cretonne 15 inches wide is needed for each laundry bag, how many bags can I cut from a yard 30 inches wide? How many yards must I buy to provide material for a class of 18 girls?

31. The following is a recipe for custard pie:

2 eggs	$\frac{1}{8}$ teaspoonful of salt
2 tablespoonfuls of sugar	2 cups of milk

Find the cost of 2 eggs at 48¢ a dozen, and 2 cups of milk (1 pint) at 8¢ a quart. Find the total cost, allowing $\frac{1}{2}$¢ for sugar and salt.

32. A farmer sowed 9 pecks of barley per acre on a 30-acre field. At 75 cents per bushel, what was the value of the seed used?

33. If 80 pounds of oats are sown per acre, how many bushels will be needed for 40 acres, allowing 32 pounds to a bushel?

34. In one year, there were raised in Minnesota 245,000 acres of potatoes, with an average of 135 bushels per acre. What was the total yield for the state?

35. John used in his woodworking class 1 jack plane costing $2, 1 try square at $.20, 1 rule at $.15, 1 bit brace at $.85, 5 auger bits at $.35 each, 1 hammer at $.55, 2 hand saws at $1.25 each, and one marking gauge at $.15. Find the total cost of his tools.

36. If a hole in an apron is $2\frac{5}{8}$ inches square, with allowance for finishing, how large a patch must I cut to extend $\frac{1}{4}$ inch beyond the hole on all sides, with $\frac{1}{8}$ inch allowance for finishing?

37. Mary cut cloth for a ruffle 8 inches deep. After she has put on a 3-inch hem and 3 quarter-inch tucks, how deep will the ruffle be?

Find the cost of:

38. 6 yards of gingham @ $.25.

39. $1\frac{1}{4}$ yards of embroidery @ $1.20.

40. 2 collar supports @ $.10.

41. $1\frac{1}{2}$ dozen buttons @ $.18.

42. Add the answers in examples 38 to 41, to find the cost of Edith's dress.

43. 1 pair of scissors @ $.45.

44. 1 tape measure @ $.10.

45. 1 emery bag @ $.10.

46. 6 spools of thread @ $.05.

47. 2 packages of needles @ $.05.

48. 1 package of pins @ $.10.

49. Add the answers in examples 43 to 48, to find the cost of fitting up a workbasket.

50. $2\frac{1}{2}$ yards of china silk @ $.58.

51. 3 yards of net @ $.50.

52. 2 yards of lace @ $.78.

53. Add the answers in examples 50 to 52, to find the cost of materials for a waist.

54. $2\frac{1}{2}$ yards of gingham @ $.35.

55. 6 packages of hairpins @ 2 for $.05.

56. 3 handkerchiefs @ $.15.

57. $4\frac{3}{4}$ yards of ribbon @ $.48.

58. Add the answers in examples 54 to 57, to find the total cost of Cora's purchases at the dry goods store.

MORE DRILLS IN ADDITION

1–32. Add the numbers in line 1, columns *a* to *d*; columns *e* and *f*. Do the same with lines 2 to 16.

33–212. In each of the 6 columns, *a* to *f*, add the numbers in lines 1 to 3, 4 to 6, 7 to 9, 8 to 10, 10 to 12, 13 to 16, 2 to 6, 3 to 7, 4 to 8, 6 to 10, 8 to 12, 12 to 16, 1 to 6, 4 to 9, 7 to 12, 5 to 10, 8 to 13, 10 to 16, 1 to 10, 3 to 12, 2 to 11, 4 to 13, 5 to 14, 7 to 16, 1 to 11, 2 to 12, 2 to 13, 3 to 15, 3 to 16, 1 to 16.

	a	*b*	*c*	*d*	*e*	*f*
1.	56	157	6058	99,457	$ 99.65	$ 854.30
2.	38	163	2345	63,205	$ 83.41	$ 321.50
3.	74	352	8629	10,100	$ 52.60	$ 615.65
4.	89	154	1234	10,300	$ 61.75	$ 189.50
5.	92	418	4132	22,356	$ 49.75	$ 708.75
6.	41	909	8005	34,543	$ 81.53	$ 810.85
7.	79	177	9212	35,678	$ 75.89	$ 3710.00
8.	63	756	7056	46,754	$ 44.61	$ 4920.95
9.	50	345	8072	58,909	$ 75.87	$ 775.76
10.	84	199	1999	82,543	$ 60.54	$ 221.09
11.	88	821	7105	67,687	$ 62.54	$ 684.54
12.	91	215	9876	54,321	$ 63.29	$ 431.17
13.	83	905	6054	74,354	$ 83.91	$ 567.32
14.	76	607	3048	82,132	$ 44.62	$ 890.49
15.	55	354	6502	12,345	$ 27.99	$ 407.15
16.	49	538	2099	95,471	$ 75.89	$ 905.28

MORE DRILLS IN SUBTRACTION

1–48. In lines 1 to 16 subtract a from b; c from d; e from f. Test.

49–198. In each of the six columns, a to f, find differences as indicated: 1 – 2, 3 – 4, 5 – 6, 7 – 8, 9 – 10, 11 – 12, 13 – 14, 15 – 16, 1 – 4, 1 – 5, 1 – 6, 1 – 15, 2 – 5, 2 – 15, 3 – 9, 3 – 12, 4 – 10, 6 – 16, 7 – 9, 8 – 12, 13 – 15, 14 – 15, 2 – 15, 7 – 12, 8 – 15.

	a	*b*	*c*	*d*	*e*	*f*
1.	98	985	999	9975	$95.59	$998.25
2.	87	949	900	9080	$90.02	$957.84
3.	86	867	888	8954	$88.98	$900.72
4.	78	853	800	7099	$80.06	$875.68
5.	79	749	777	7056	$74.86	$863.50
6.	65	738	760	7030	$65.74	$852.44
7.	63	724	700	6243	$58.65	$749.20
8.	60	703	649	6021	$53.59	$731.58
9.	58	695	632	6000	$49.44	$728.40
10.	56	687	600	5941	$44.38	$657.79
11.	52	653	558	5638	$42.24	$649.67
12.	48	549	543	5600	$38.13	$635.83
13.	43	538	449	5542	$35.09	$527.72
14.	41	429	432	4778	$33.93	$516.65
15.	39	410	317	4697	$30.87	$508.44
16.	30	310	300	4321	$29.72	$495.39

MORE DRILLS IN MULTIPLICATION AND DIVISION

1–64. Multiply each multiplicand 1 to 8 by each multiplier *a* to *h*; as, 1 *a*, 5642 by 56, 8 *g*, 8645 by 123.

65–128. Multiply each multiplicand 9 to 16 by each multiplier *i* to *p*; as, 9 *n*, $87.65 by 681.

1.	5642	*a.*	56	9.	$ 87.65	*i.*	145
2.	7354	*b.*	78	10.	$ 43.21	*j.*	287
3.	9781	*c.*	97	11.	$ 50.07	*k.*	300
4.	6431	*d.*	64	12.	$ 60.90	*l.*	463
5.	5782	By *e.*	39	13.	$ 98.76	By *m.*	502
6.	9045	*f.*	85	14.	$ 50.43	*n.*	681
7.	7002	*g.*	123	15.	$621.05	*o.*	799
8.	8645	*h.*	164	16.	$481.76	*p.*	806

129–192. Divide each dividend from 1 to 8 by each divisor from *a* to *h*; as, 1 *h*, 340,672 ÷ 401.

193–256. Divide each dividend from 9 to 16 by each divisor from *i* to *p*; as, 9 *k*, $14,027.65 ÷ 518.

1.	340,672	*a.*	549	9.	$14,027.65	*i.*	349
2.	557,830	*b.*	632	10.	$98,052.74	*j.*	867
3.	643,457	*c.*	721	11.	$84,709.56	*k.*	518
4.	782,600	*d.*	805	12.	$45,678.05	*l.*	220
5.	891,708	By *e.*	700	13.	$30,050.04	By *m.*	715
6.	905,500	*f.*	604	14.	$85,070.69	*n.*	644
7.	876,609	*g.*	305	15.	$70,987.83	*o.*	577
8.	785,702	*h.*	401	16.	$64,065.42	*p.*	809

MORE DRILLS IN FRACTIONS

1. Change $\frac{1}{2}$ to 4ths; to 6ths; to 8ths; to 10ths; to 12ths; to 14ths; to 16ths.

2. Change $\frac{1}{3}$ to 6ths; to 9ths; to 12ths; to 15ths. Change $\frac{2}{3}$ to 6ths; to 9ths; to 12ths; to 15ths.

3. Change $\frac{1}{4}$ to 8ths; to 12ths; to 16ths. Change $\frac{3}{4}$ to 8ths; to 12ths; to 16ths.

4. Change $\frac{1}{5}$ to 10ths; to 15ths. Change $\frac{2}{5}$ to 10ths; to 15ths.

5. Change $\frac{1}{6}$ to 12ths; $\frac{5}{6}$ to 12ths; $\frac{1}{7}$ to 14ths.

6. Change $\frac{1}{8}$, $\frac{3}{8}$, $\frac{5}{8}$, $\frac{7}{8}$, each to 16ths.

7. Change to halves: $\frac{2}{4}$; $\frac{3}{6}$; $\frac{4}{8}$; $\frac{5}{10}$; $\frac{6}{12}$; $\frac{7}{14}$; $\frac{8}{16}$.

8. Change to thirds: $\frac{2}{6}$; $\frac{4}{6}$; $\frac{3}{9}$; $\frac{6}{9}$; $\frac{4}{12}$; $\frac{8}{12}$; $\frac{5}{15}$; $\frac{10}{15}$.

9. Change to fourths: $\frac{4}{8}$; $\frac{6}{8}$; $\frac{3}{12}$; $\frac{6}{12}$; $\frac{9}{12}$; $\frac{4}{16}$; $\frac{8}{16}$; $\frac{12}{16}$.

10. Change to fifths: $\frac{2}{10}$; $\frac{4}{10}$; $\frac{6}{10}$; $\frac{8}{10}$; $\frac{3}{15}$; $\frac{6}{15}$; $\frac{9}{15}$; $\frac{12}{15}$.

11. Change to sixths: $\frac{2}{12}$; $\frac{4}{12}$; $\frac{6}{12}$; $\frac{8}{12}$; $\frac{10}{12}$.

12. Change to sevenths: $\frac{2}{14}$; $\frac{4}{14}$; $\frac{6}{14}$; $\frac{8}{14}$; $\frac{10}{14}$; $\frac{12}{14}$.

13. Change to eighths: $\frac{2}{16}$; $\frac{4}{16}$; $\frac{6}{16}$; $\frac{8}{16}$; $\frac{10}{16}$; $\frac{12}{16}$; $\frac{14}{16}$.

14. First add; then subtract:

$\frac{1}{2}$	$\frac{2}{3}$	$\frac{2}{3}$	$9\frac{2}{5}$	$8\frac{3}{4}$	$7\frac{2}{3}$	$6\frac{7}{16}$
$\frac{2}{5}$	$\frac{1}{4}$	$\frac{1}{5}$	$4\frac{2}{10}$	$3\frac{2}{3}$	$2\frac{1}{6}$	$5\frac{5}{8}$

Find products:

15. $3\frac{1}{2} \times 16$; $4\frac{3}{4} \times 24$; $5\frac{1}{6} \times 30$; $2\frac{2}{3} \times 18$; $2\frac{1}{9} \times 18$; $1\frac{1}{16} \times 32$; $2\frac{1}{5} \times 10$; $3\frac{1}{7} \times 14$; $2\frac{3}{8} \times 24$; $3\frac{3}{10} \times 40$; $3\frac{1}{12} \times 36$; $2\frac{3}{16} \times 48$.

MULTIPLICATION TABLE

1 × 1 = 1	2 × 1 = 2	3 × 1 = 3	4 × 1 = 4
1 × 2 = 2	2 × 2 = 4	3 × 2 = 6	4 × 2 = 8
1 × 3 = 3	2 × 3 = 6	3 × 3 = 9	4 × 3 = 12
1 × 4 = 4	2 × 4 = 8	3 × 4 = 12	4 × 4 = 16
1 × 5 = 5	2 × 5 = 10	3 × 5 = 15	4 × 5 = 20
1 × 6 = 6	2 × 6 = 12	3 × 6 = 18	4 × 6 = 24
1 × 7 = 7	2 × 7 = 14	3 × 7 = 21	4 × 7 = 28
1 × 8 = 8	2 × 8 = 16	3 × 8 = 24	4 × 8 = 32
1 × 9 = 9	2 × 9 = 18	3 × 9 = 27	4 × 9 = 36
1 × 10 = 10	2 × 10 = 20	3 × 10 = 30	4 × 10 = 40
1 × 11 = 11	2 × 11 = 22	3 × 11 = 33	4 × 11 = 44
1 × 12 = 12	2 × 12 = 24	3 × 12 = 36	4 × 12 = 48

5 × 1 = 5	6 × 1 = 6	7 × 1 = 7	8 × 1 = 8
5 × 2 = 10	6 × 2 = 12	7 × 2 = 14	8 × 2 = 16
5 × 3 = 15	6 × 3 = 18	7 × 3 = 21	8 × 3 = 24
5 × 4 = 20	6 × 4 = 24	7 × 4 = 28	8 × 4 = 32
5 × 5 = 25	6 × 5 = 30	7 × 5 = 35	8 × 5 = 40
5 × 6 = 30	6 × 6 = 36	7 × 6 = 42	8 × 6 = 48
5 × 7 = 35	6 × 7 = 42	7 × 7 = 49	8 × 7 = 56
5 × 8 = 40	6 × 8 = 48	7 × 8 = 56	8 × 8 = 64
5 × 9 = 45	6 × 9 = 54	7 × 9 = 63	8 × 9 = 72
5 × 10 = 50	6 × 10 = 60	7 × 10 = 70	8 × 10 = 80
5 × 11 = 55	6 × 11 = 66	7 × 11 = 77	8 × 11 = 88
5 × 12 = 60	6 × 12 = 72	7 × 12 = 84	8 × 12 = 96

9 × 1 = 9	10 × 1 = 10	11 × 1 = 11	12 × 1 = 12
9 × 2 = 18	10 × 2 = 20	11 × 2 = 22	12 × 2 = 24
9 × 3 = 27	10 × 3 = 30	11 × 3 = 33	12 × 3 = 36
9 × 4 = 36	10 × 4 = 40	11 × 4 = 44	12 × 4 = 48
9 × 5 = 45	10 × 5 = 50	11 × 5 = 55	12 × 5 = 60
9 × 6 = 54	10 × 6 = 60	11 × 6 = 66	12 × 6 = 72
9 × 7 = 63	10 × 7 = 70	11 × 7 = 77	12 × 7 = 84
9 × 8 = 72	10 × 8 = 80	11 × 8 = 88	12 × 8 = 96
9 × 9 = 81	10 × 9 = 90	11 × 9 = 99	12 × 9 = 108
9 × 10 = 90	10 × 10 = 100	11 × 10 = 110	12 × 10 = 120
9 × 11 = 99	10 × 11 = 110	11 × 11 = 121	12 × 11 = 132
9 × 12 = 108	10 × 12 = 120	11 × 12 = 132	12 × 12 = 144

TABLES OF MEASURES

DRY MEASURE

2 pints (pt.) = 1 quart (qt.)
8 quarts = 1 peck (pk.)
4 pecks = 1 bushel (bu.)

LIQUID MEASURE

2 pints (pt.) = 1 quart (qt.)
4 quarts = 1 gallon (gal.)

LONG MEASURE

12 inches (in.) = 1 foot (ft.)
3 feet = 1 yard (yd.)
16½ feet = 1 rod (rd.)
5280 feet = 1 mile (mi.)
320 rods = 1 mile

SQUARE MEASURE

144 square inches (sq. in.) = 1 square foot (sq. ft.)
9 square feet = 1 square yard (sq. yd.)
30¼ square yards = 1 square rod (sq. rd.)
160 square rods = 1 acre (A.)

TIME

60 seconds (sec.) = 1 minute (min.)
60 minutes = 1 hour (hr.)
24 hours = 1 day
7 days = 1 week (wk.)
12 months (mo.) = 1 year (yr.)

WEIGHT

16 ounces (oz.) = 1 pound (lb.)
2000 pounds = 1 ton (T.)

COUNTING

12 things = 1 dozen

UNITED STATES MONEY

5 cents (¢) = 1 nickel
10 cents = 1 dime (d.)
10 dimes = 1 dollar ($)
100 cents = 1 dollar

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